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ELECTRICAL REVIEW

MARCH 1958

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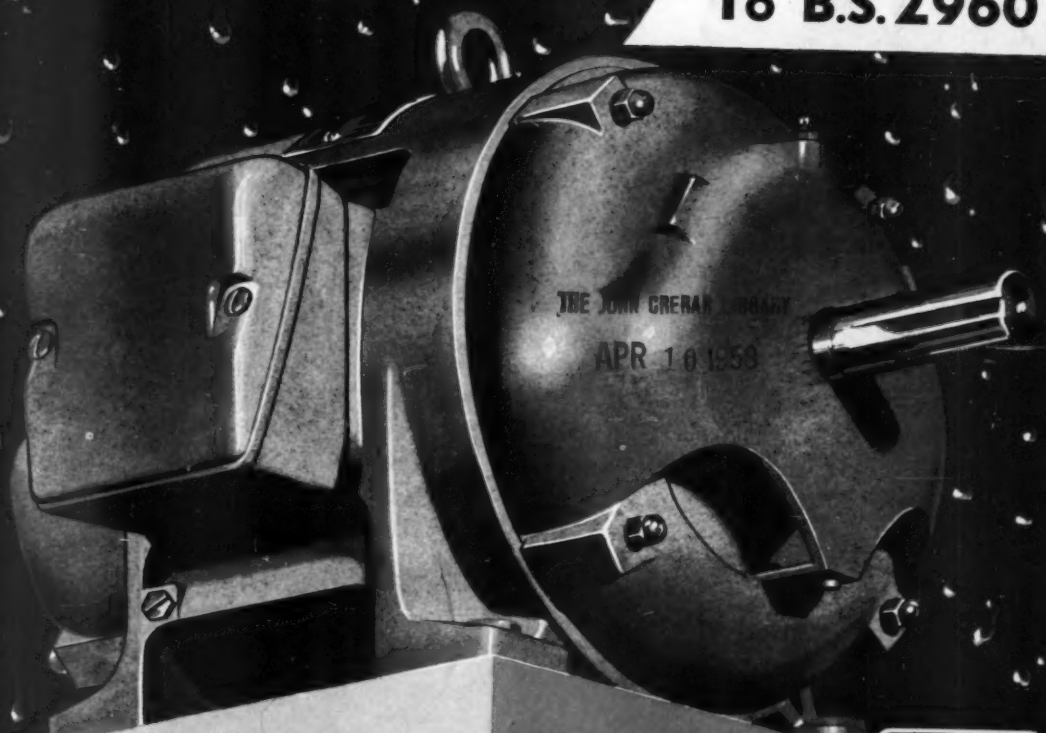
Standard motor

To B.S.2960



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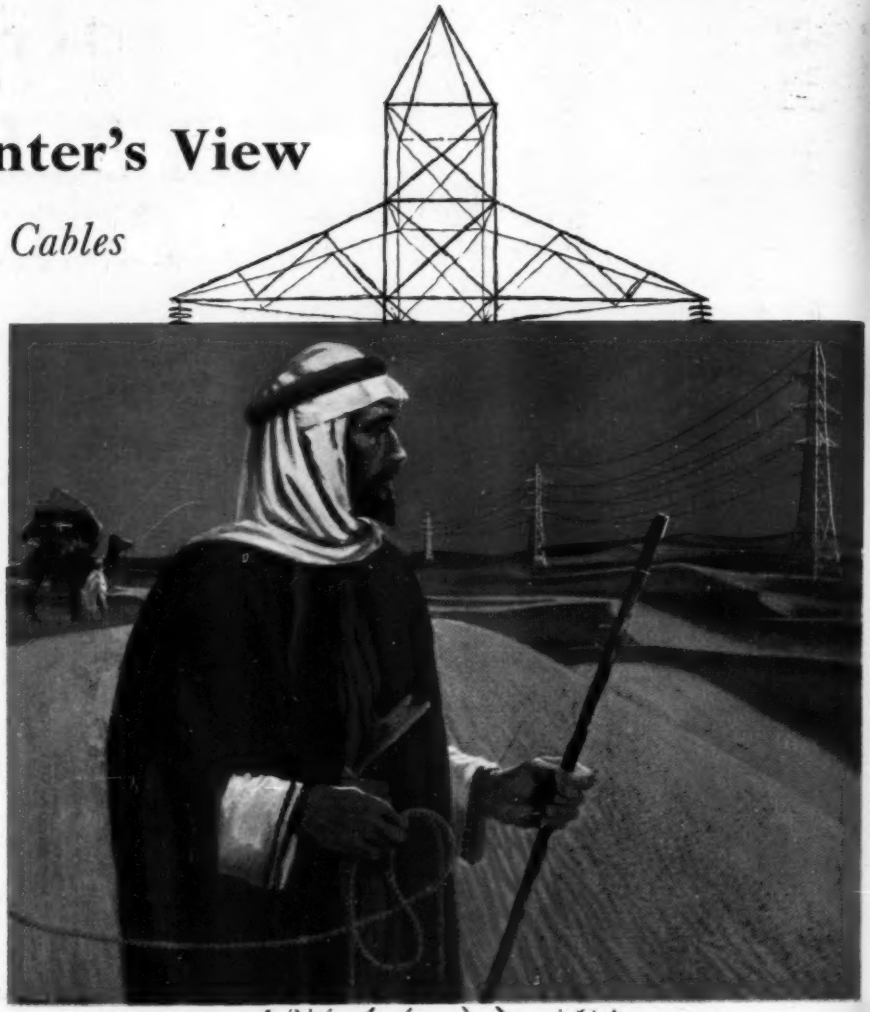
BROOK MOTORS Ltd

More compact • lower cost

WRITE FOR LIST 851

The Painter's View

Caravan for Cables



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Throughout the world engineers know that they can rely on towers made by Painter Brothers, for 30 years of specialised experience in the fabrication and hot dip galvanising of mass-produced structures, coupled with the knowledge gained from the operation of their tower testing plant, go behind every ton produced—that is why Painter Brothers' towers are Towers of Strength.

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ELECTRICAL TRANSMISSION TOWERS AND POLES

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CALLENDER-HAMILTON BRIDGES

Painter Bros. Ltd.

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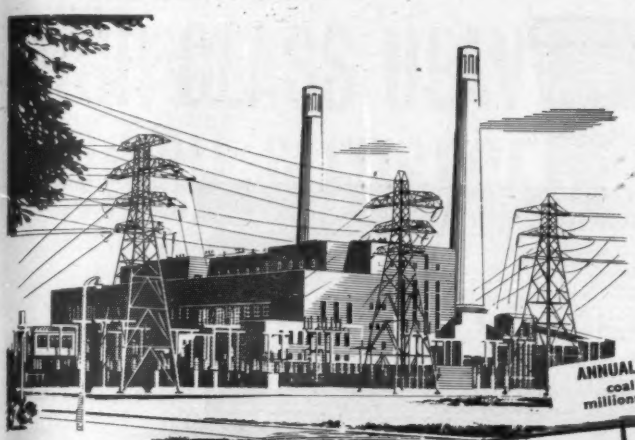

BRITAIN'S FUEL PROBLEM

FOR ELECTRICAL POWER GENERATION

		ANNUAL FUEL REQUIREMENT coal or equivalent millions of tons
NOW	Generating plant installed : 20,000 MW	40
by 1975	Estimated capacity of generating plant installed : 60,000 MW	100
,,	Maximum tonnage of coal likely to be available per annum for electricity generation	65
	Gap that must be filled, by using other fuels	35
	i.e. by using OIL . . . . . (coal equivalent)	10
	and by using NUCLEAR fuels . . . (coal equivalent)	25

World's first 500,000 k.w. atomic power station ; being built at Hinkley Point, Somerset by the English Electric, Babcock & Wilcox, Taylor Woodrow atomic power group.

Babcock & Wilcox Ltd. bring to the solution of this problem an unsurpassed experience in the design and construction of modern steam power plant to operate with high efficiency on every kind and grade of fuel—solid, liquid or nuclear.

BABCOCK

POWER PLANT

BABCOCK & WILCOX LTD. BABCOCK HOUSE 209 EUSTON RD. LONDON N.W.1

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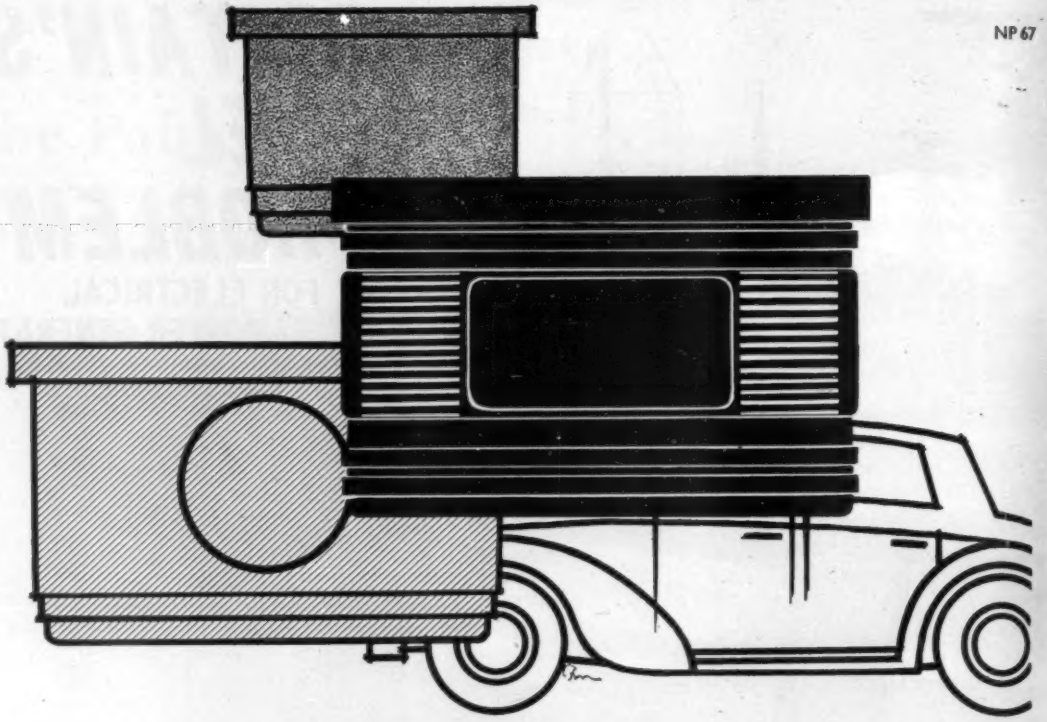

new plant makes battery boxes better still

Our new plant at Swindon is not only an exercise in rational manufacturing methods, it also makes better battery boxes, both from bitumen asbestos compound and from hard rubber.

Working on the principle that what goes up must come down we persuade raw materials to mount aloft and, with a little persuasion, to spread themselves into a "biscuit" ready for the presses. There the moulds, designed and built in our own tool-room, produce the finished boxes with remarkably little fuss. A conveyor speeds them on their way to "packing and dispatch" with the minimum of human interference. These boxes are, in our opinion, as good if not better than anyone else's and that is what really matters to you, the user.

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NATIONAL PLASTICS (SALES) LTD

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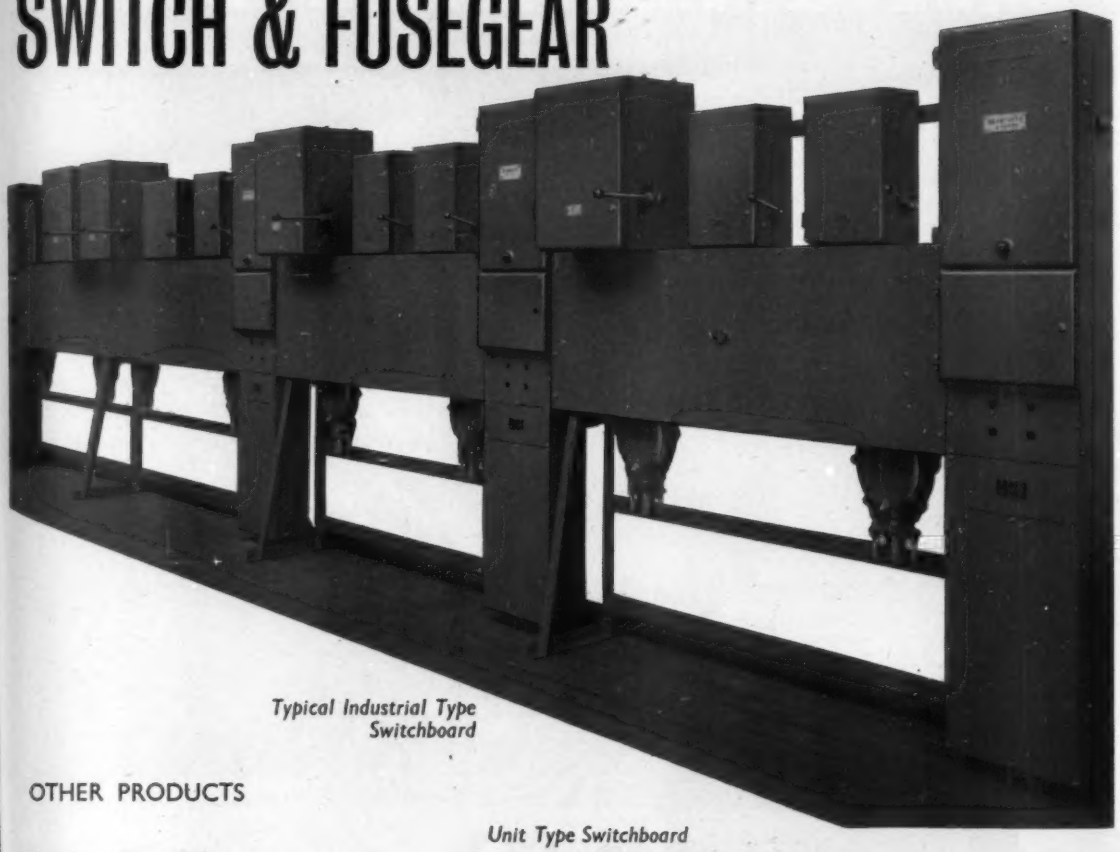

Typical Industrial Type Switchboard

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Rising Main Systems
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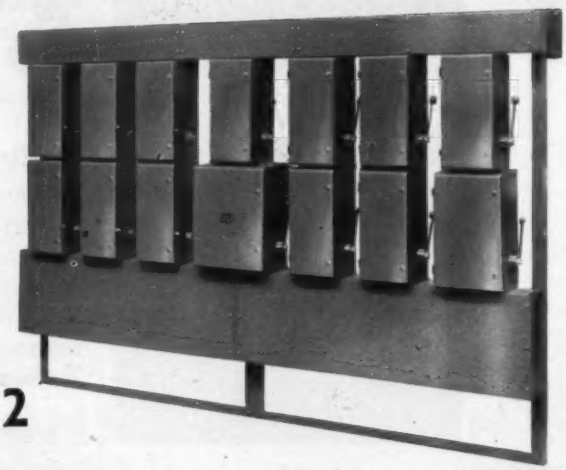
Fuseboards
Switchfuses
Cable Trunking

Unit Type Switchboard



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MARCH 25TH TO 29TH 1958

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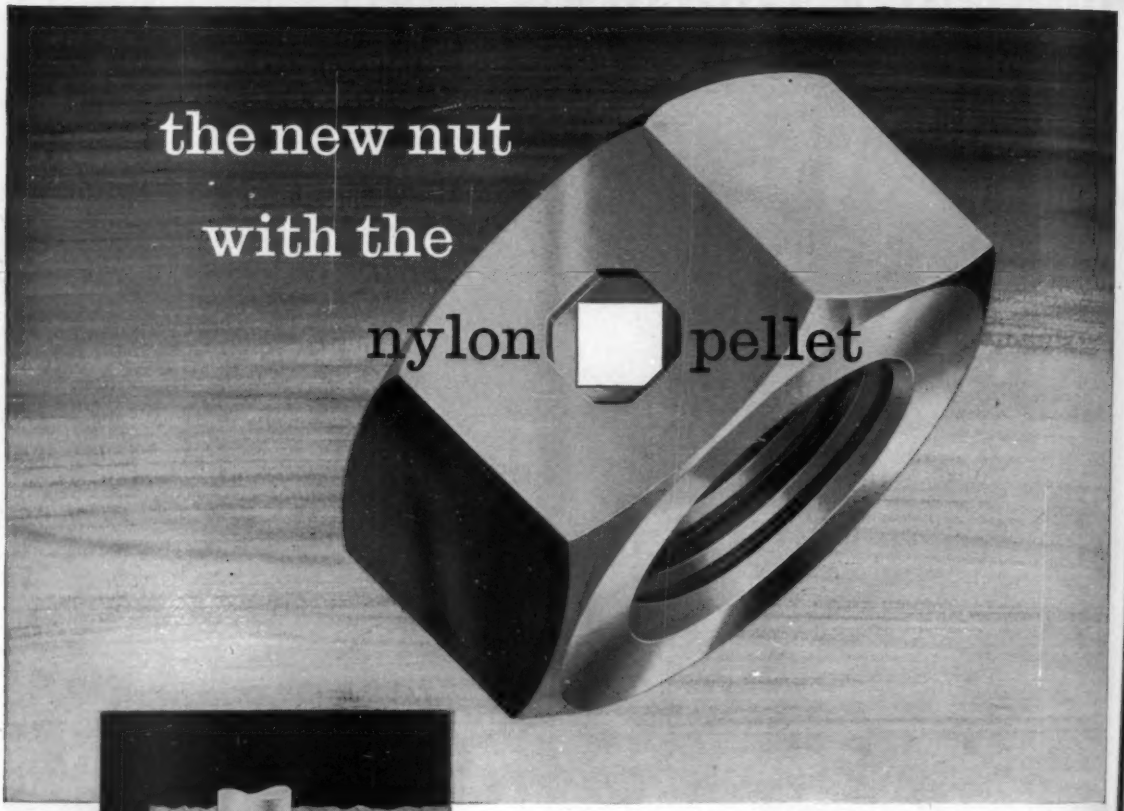
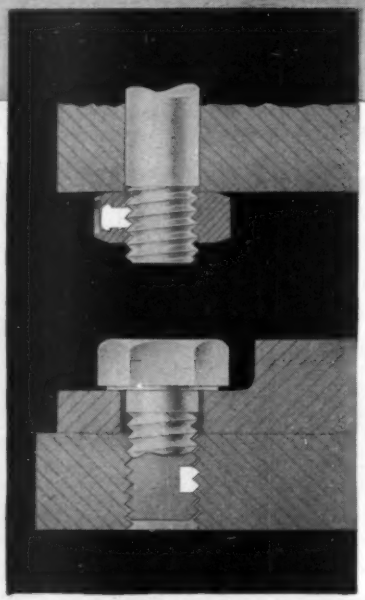
WEDGLOK





Wedglok nuts are completely self-locking. They will not work loose through vibration or reversal of stress. They need no locking devices—and the locking-action is unaffected by age or temperatures within the normal range.

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In a Wedglok nut the locking element consists of a tough, resilient nylon pellet. This is inserted in the body of the nut and projects slightly above the crest of the thread. When the nut is turned the pellet sets up a wedging action, gripping the threads tightly. This counter-thrust creates metal to metal engagement of mating threads. The Wedglok principle can be applied to screws as well.

If it's a matter of how to fasten one thing to another . . . get in touch with GKN

Wedglok Self-Locking Products are manufactured under licence in the United Kingdom solely by
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275-kV TRANSFORMERS BY BTH

1951

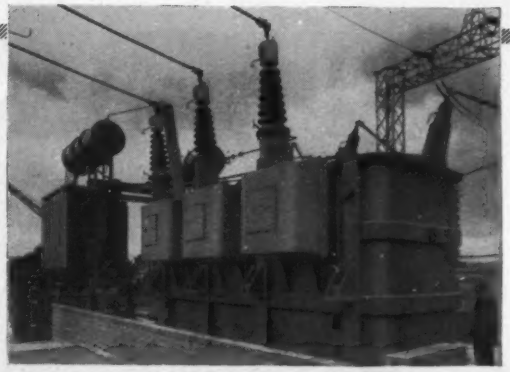
120 MVA UNDER CONSTRUCTION

BTH were first to be awarded a contract for the supply of 120-MVA 275/132-kV transformers for the C.E.G.B. Super Grid.

1953

120 MVA IN SERVICE

The first 120-MVA unit was commissioned in July 1953. Up to date, ten of these units have been installed or are on order.



120-MVA 275/132-kV transformers at the Staythorpe Sub Station of the C.E.G.B.

Another step forward

1957

180-MVA ORDER PLACED ON FACTORY

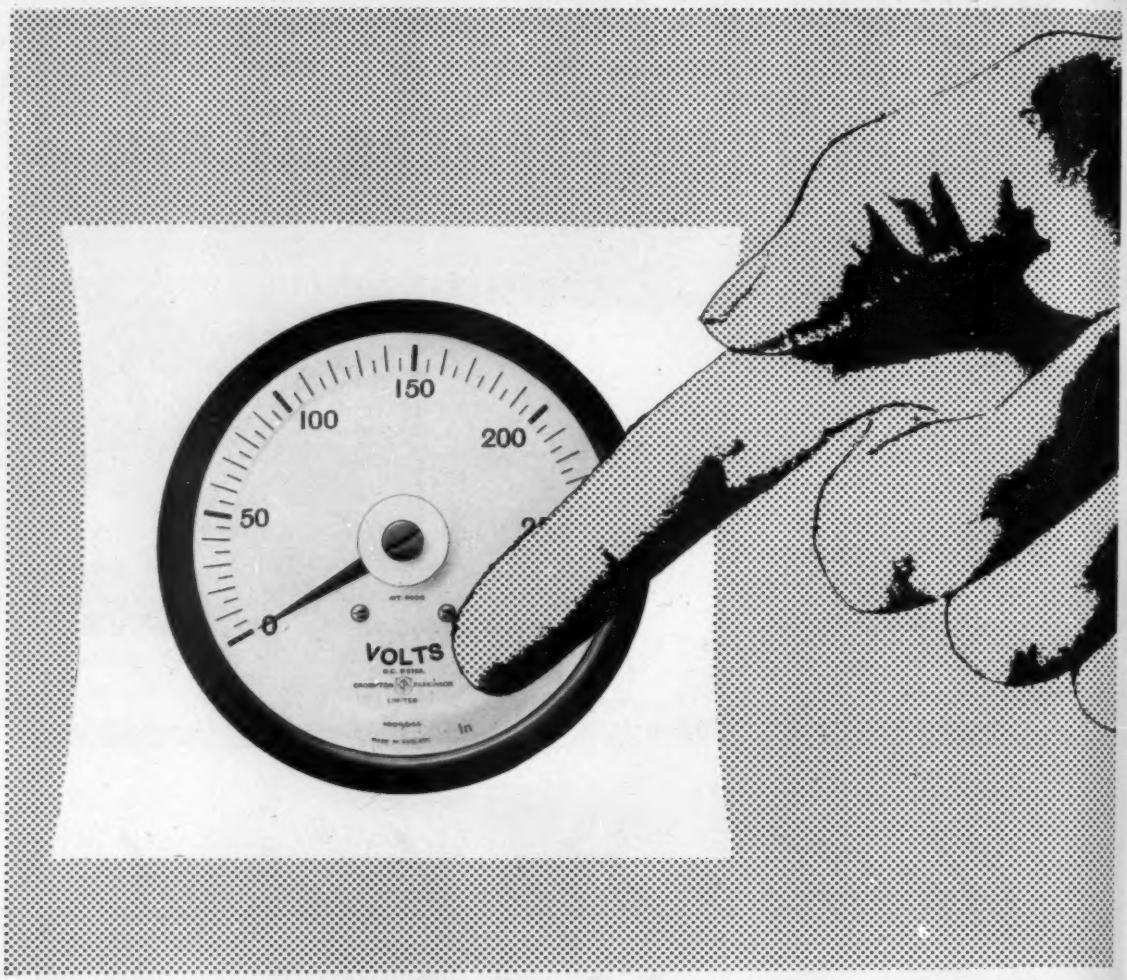
C.E.G.B. has now placed with BTH one of the first two orders for 180-MVA 275/132-kV transformers

B T-H **BRITISH THOMSON-HOUSTON**

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

An AEI company

A.S.E.E. EXHIBITION—VISIT OUR STAND No. J12 A5202



No sufferer from cramp

Crompton Parkinson instruments are indeed extremely accurate—and their robust and carefully thought out design ensures that they maintain this accuracy throughout their lives. But the accuracy of the finest instrument can be impaired by a cramped scale or by parallax errors in reading.

Circular scale instruments open the scale out by considerably increasing its length—10 in. instead of 6 in. in a 6 in. diameter instrument. And the Crompton platform scale in which the pointer is level with the scale markings eliminates parallax even at oblique angles. Finally, remember—Crompton Parkinson make a wide range of *portable* circular scale instruments.

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LIMITED

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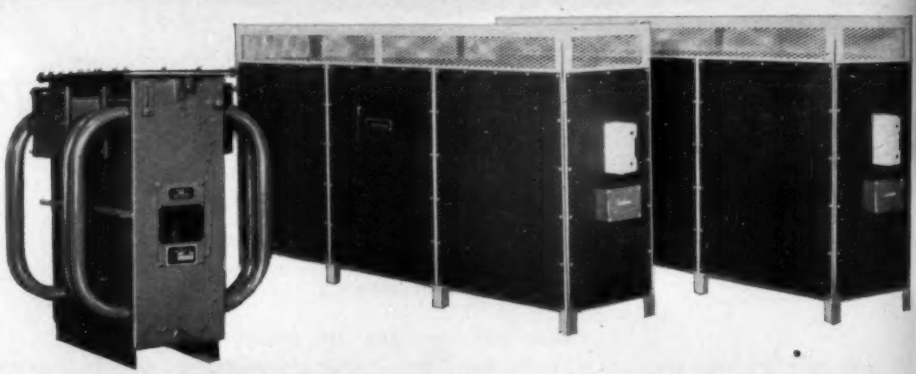
in rectifier equipment

you need G.E.C. reliability



G.E.C.

G.E.C. manufactures rectifier equipment to suit the needs of every industry.

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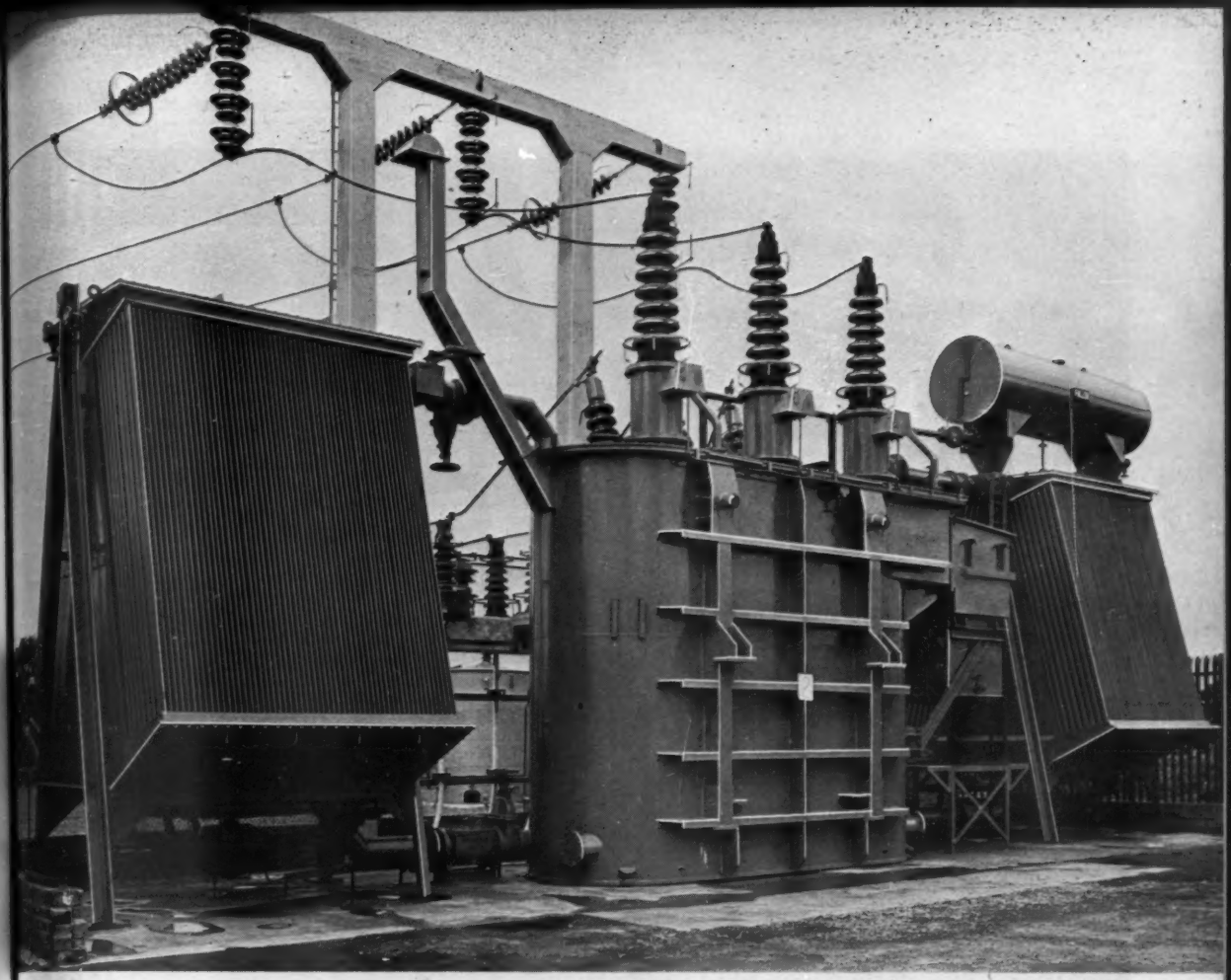

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built under ideal conditions
built to the most stringent specifications

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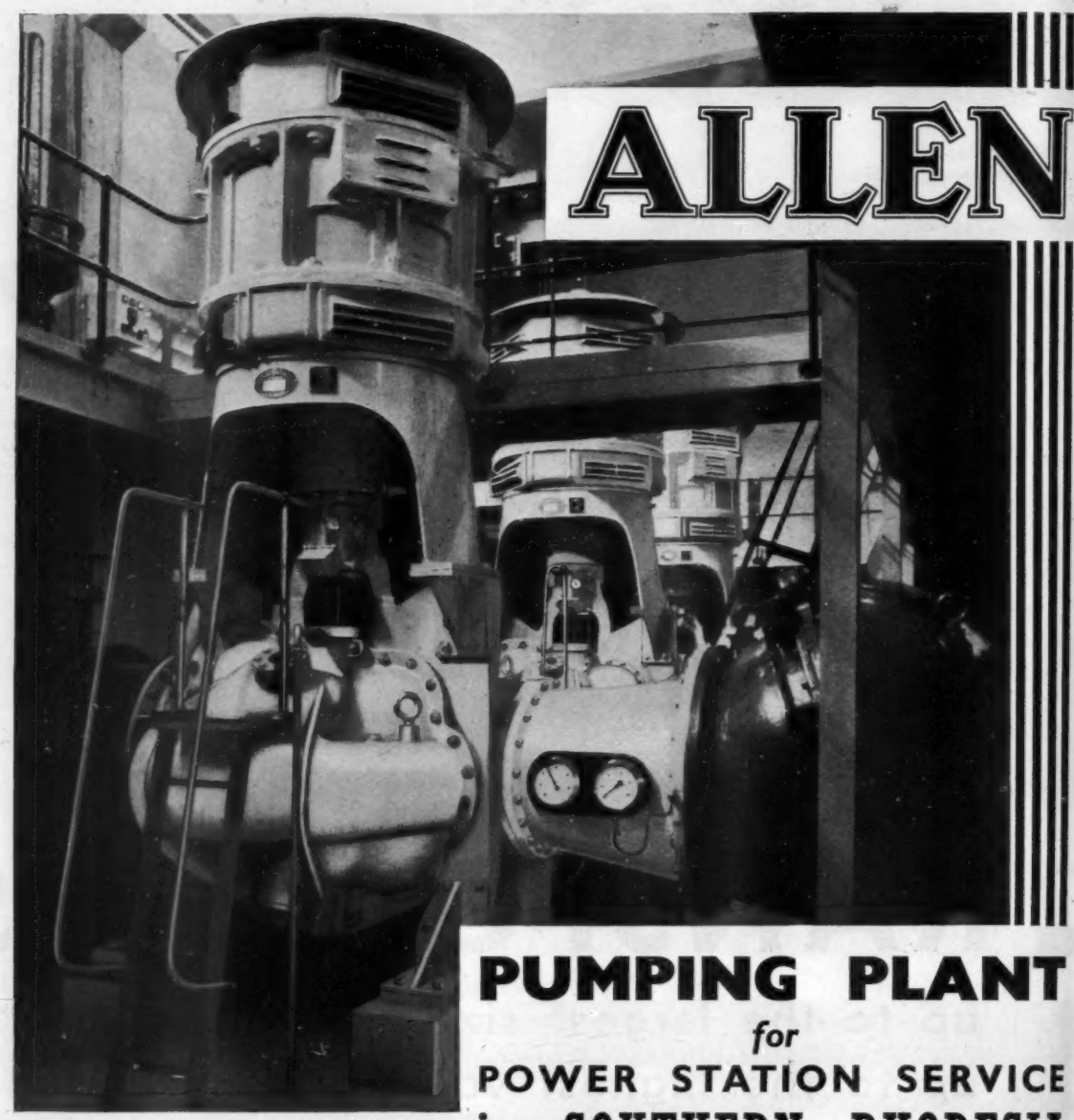

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POWER STATION SERVICE
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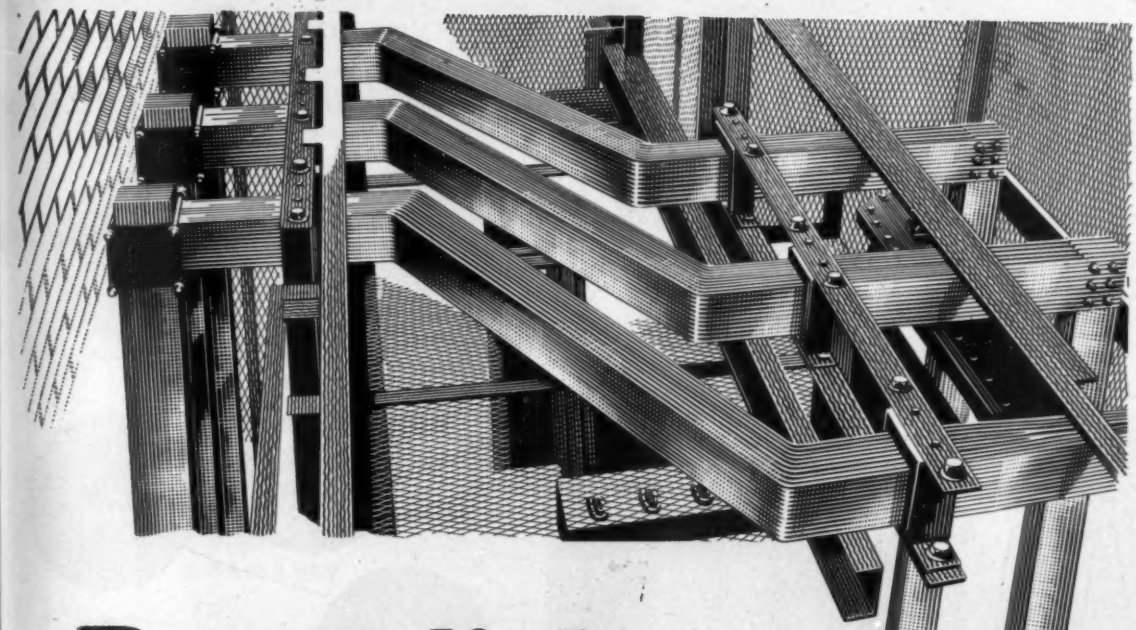

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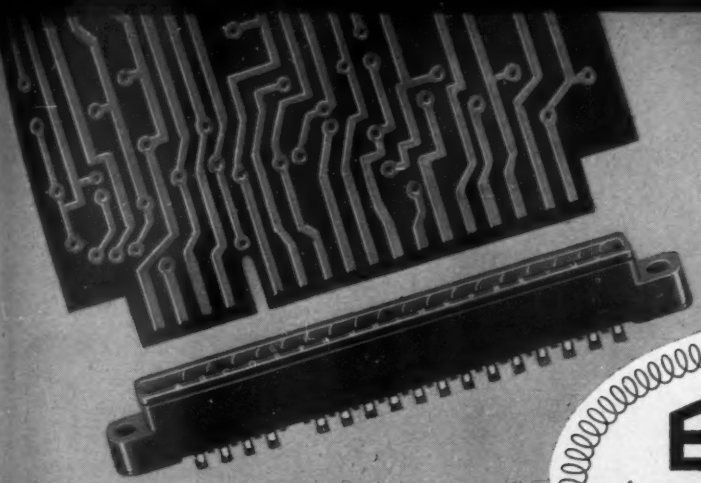

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END FIXING
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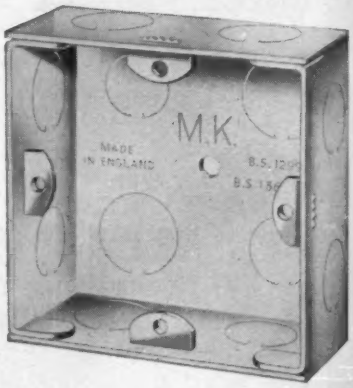
ADD MK INGENUITY AND THEY ALL GO INTO A BS 1363 BOX!



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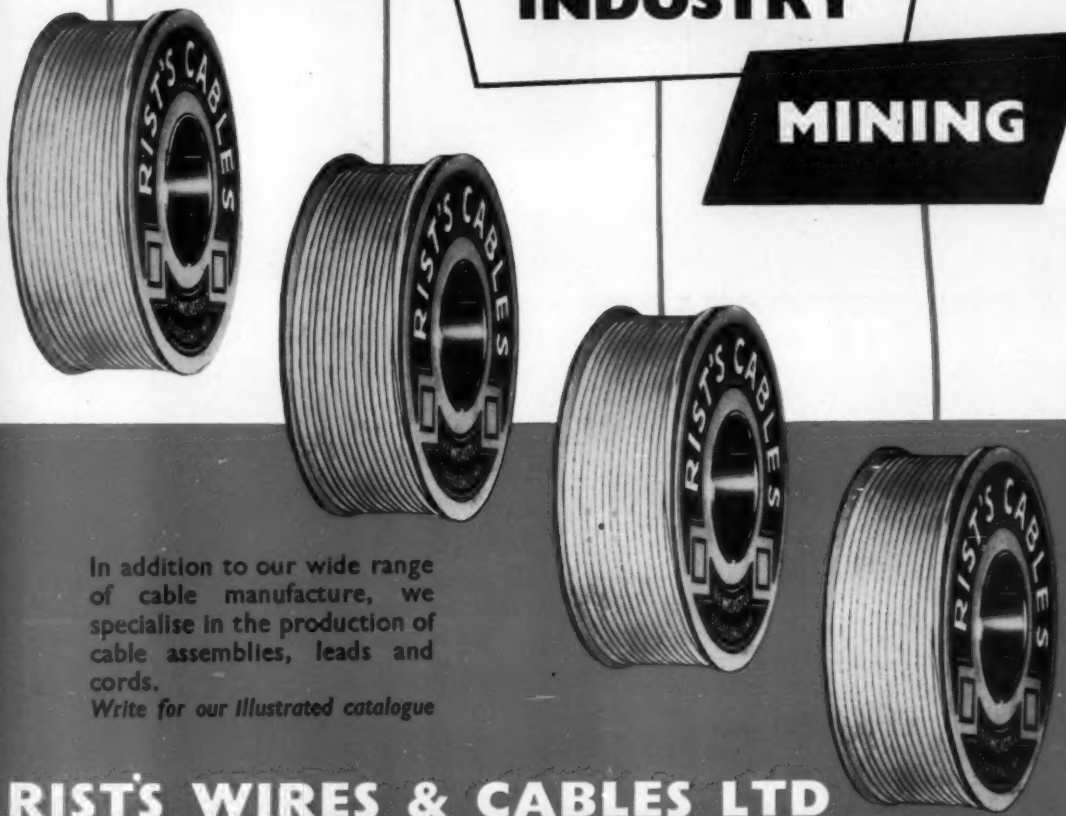

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A*

new!

101

range

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by

G.E.C.

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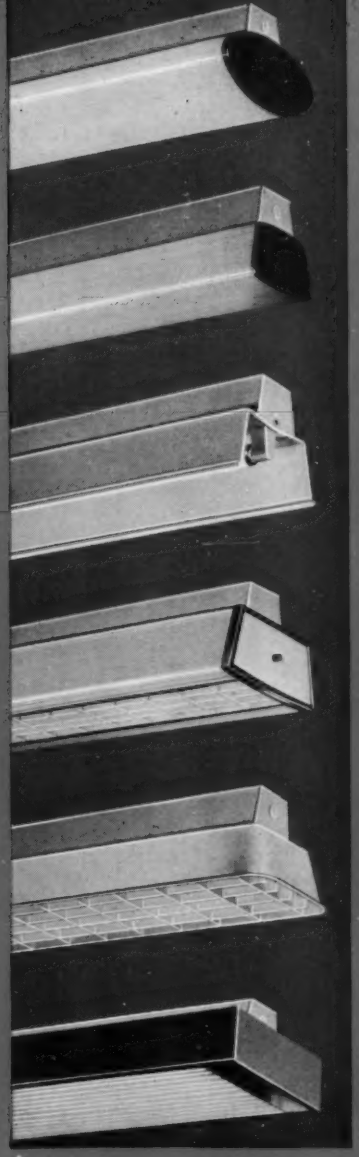


The 101 Range is an entirely new range of contemporary styled industrial, commercial and decorative fluorescent fittings—the successful outcome of team work by G.E.C. fittings designers and illuminating engineers.

The 101 Range sets a new standard of adaptability. Using as a basis channels of common cross section, various single or twin light fittings from 1½ ft. to 8 ft. in length are built without a multitude of small parts.

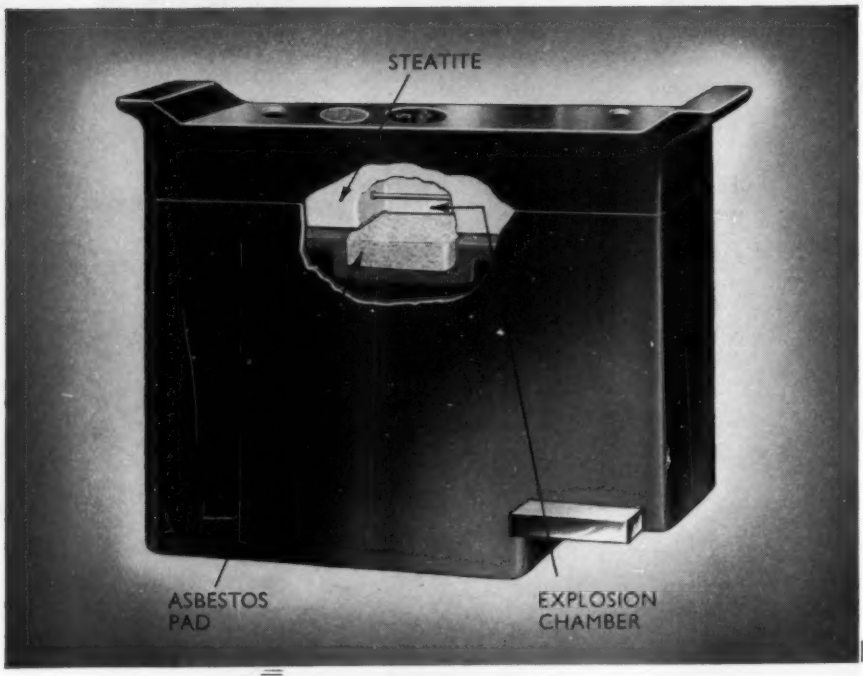
The 101 Range offers the industrial user for the first time vitreous enamelled closed end trough reflectors made from a single pressing, jointless and with well-rounded corners. They are lighter, less susceptible to damage and easier to handle and clean.

The 101 Range uses in its 8 ft. fittings new Osram 125 w. tubes with recessed double contact caps. This new cap design protects tube ends and allows replacement by one person from one ladder position. Other advantages of the new caps are firm support and location of tube without contact pins or independent clips, and smaller "dead region" at tube ends with consequent shadow reduction. In the 5 ft. fittings, as well as the shorter units, bi-pin holders are standard. Osram guaranteed tubes are available in these lengths with bi-pin caps.

The 101 Range *of fluorescent fittings is fully described and illustrated in a lavish new catalogue—publication F4068—which will be sent to you on request.*

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

"Little Things mean a lot"



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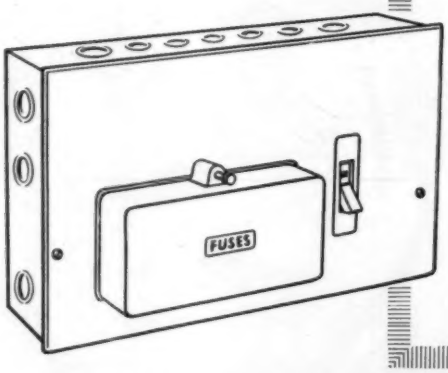
is so designed that the hottest part of the fuse wire is in an enclosed chamber. So, probability of the rupture is in the chamber.
One of the little things that make Wylex Units
WORTH A LOT MORE



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METAL CLAD (Brown only) 3, 4, 6, 8 Ways
Any combination of 5, 15, and 30 amp. Fuses
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POTENTIOMETER-RHEOSTATS

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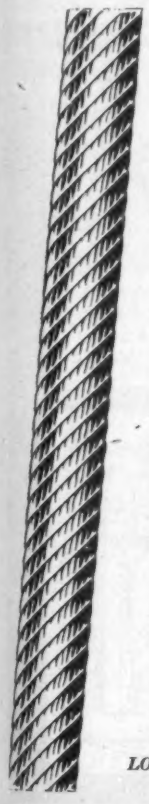
See our Stand No. U.5. A.S.E.E. Exhibition, Earls Court, March 25th—29th.



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SPECIALLY DESIGNED ELECTRIC WINCHES

Imperial Chemical Industries Ltd. called in London Electric Firm when they needed special electric winches for their new "Terylene" factory at Wilton, Middlesbrough.

The problem concerned was successfully overcome by L.E.F. technicians and 'made to measure' winches were supplied. Since this first order two years ago, special electric winches have been supplied regularly for various applications.

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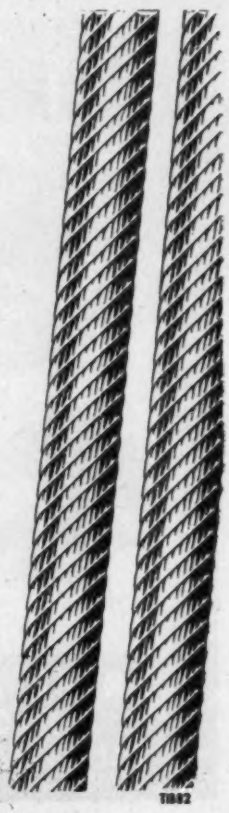

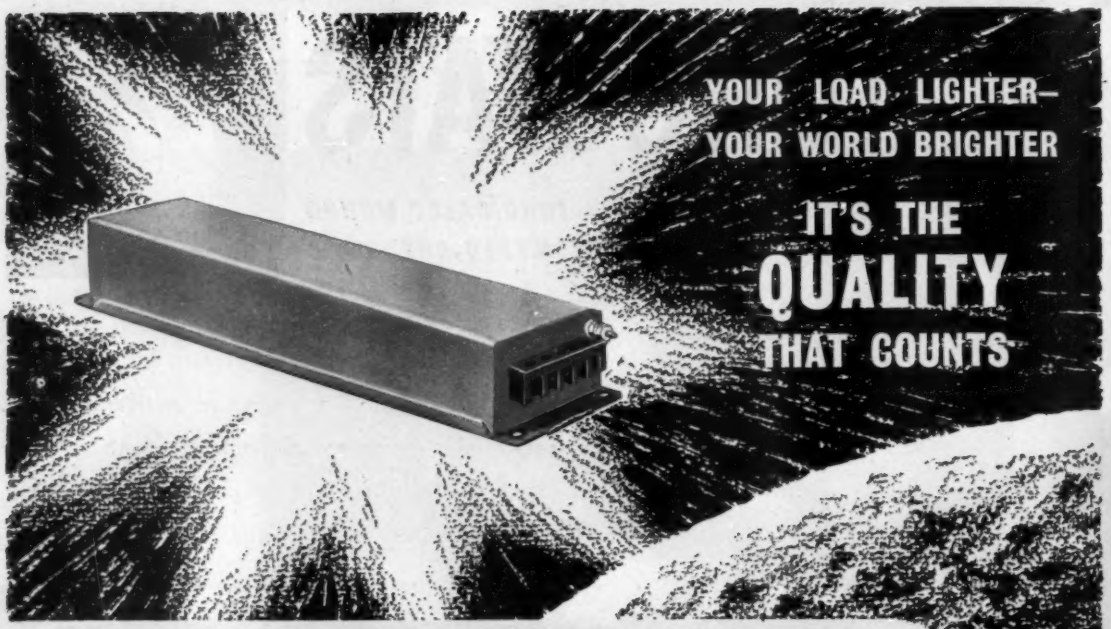

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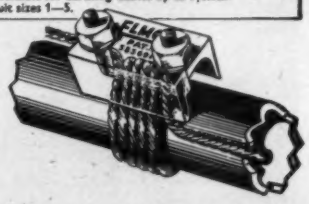

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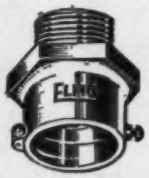
Inside Diameter	⅜"	½"	¾"	1"	1¼"	1½"	2"

Electric Thread (Male)	⅜"	½"	¾"	1"
Inside Diameter Flexible Conduit	½"	⅝"	¾"	1"

WITH EARTHING TERMINAL



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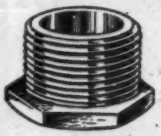

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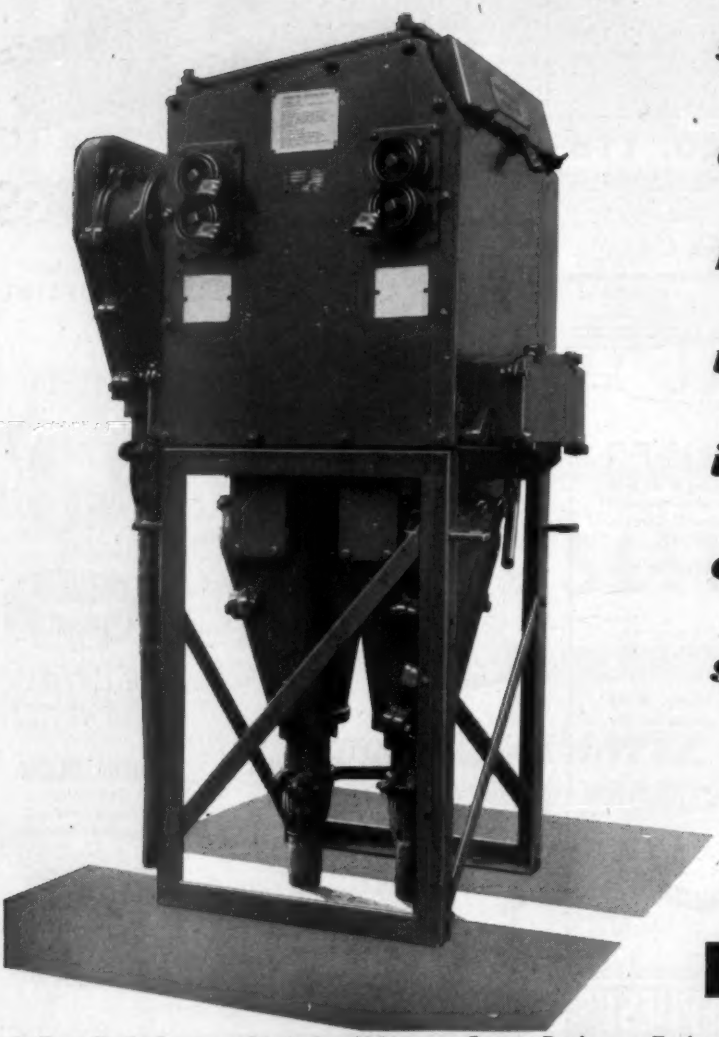

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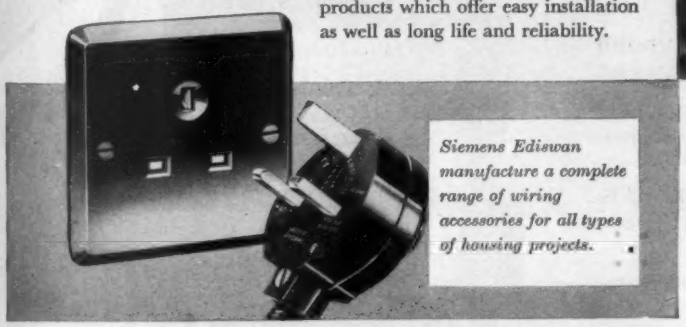

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BUILDERS: Holland & Hannen and Cubitts Ltd., 1 Queen Anne's Gate, London, S.W.1.

ELECTRICAL CONTRACTORS: F. E. Morris Ltd., Mina Avenue, Langley, Slough. (Part). Holliday & Son (Electrical) Ltd., Balham High Road, London, S.W.12. (Part).

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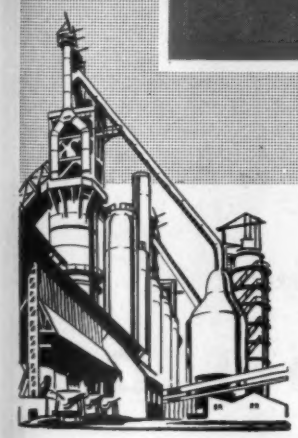

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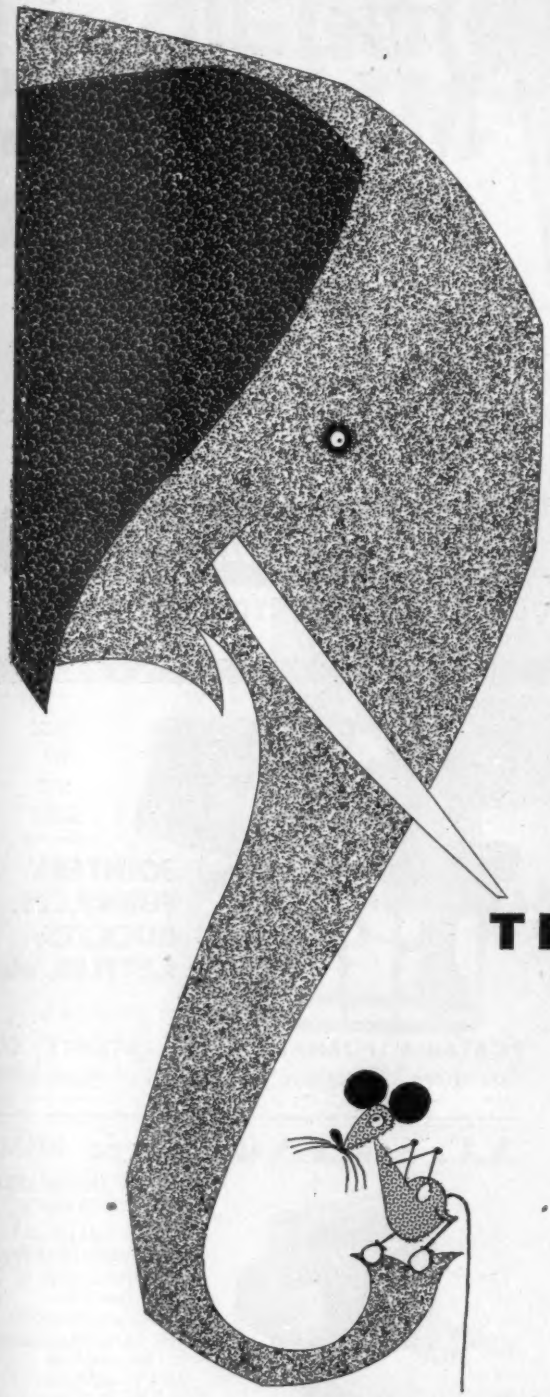

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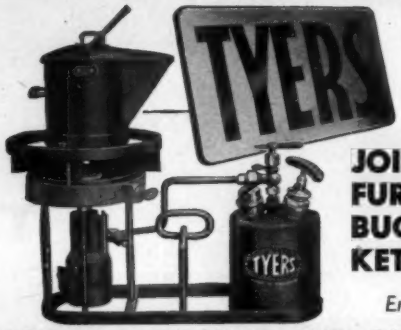

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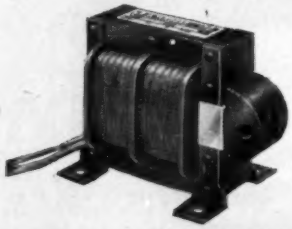

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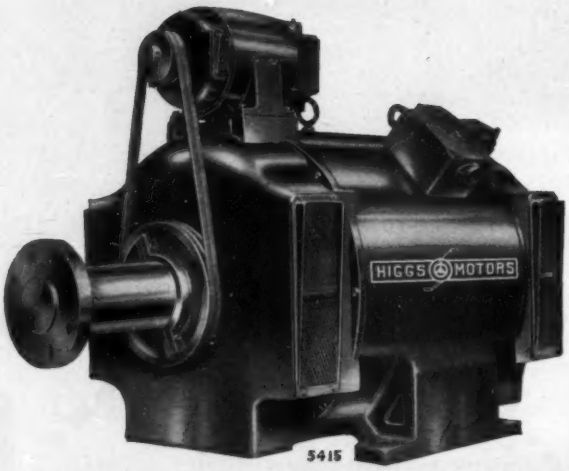

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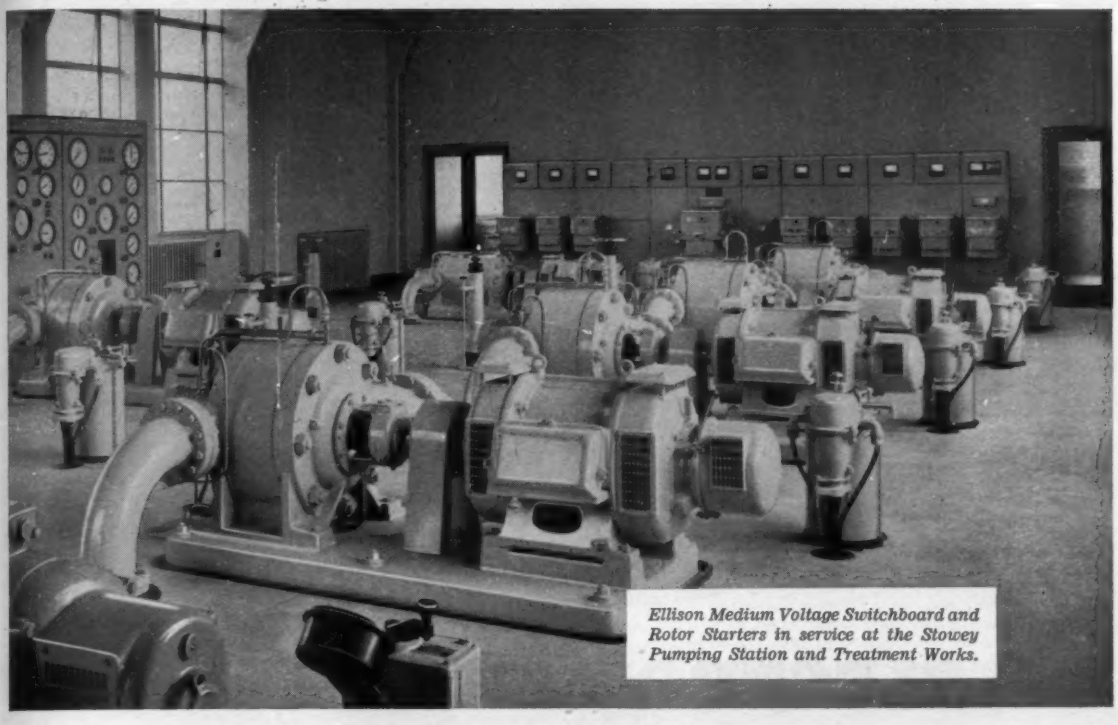

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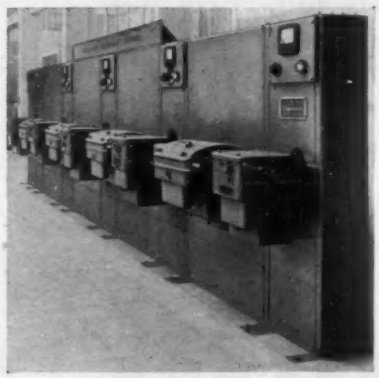

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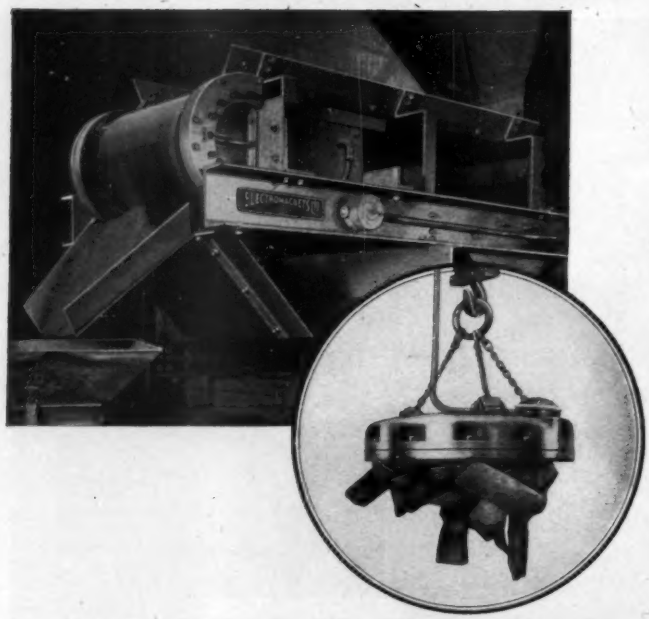

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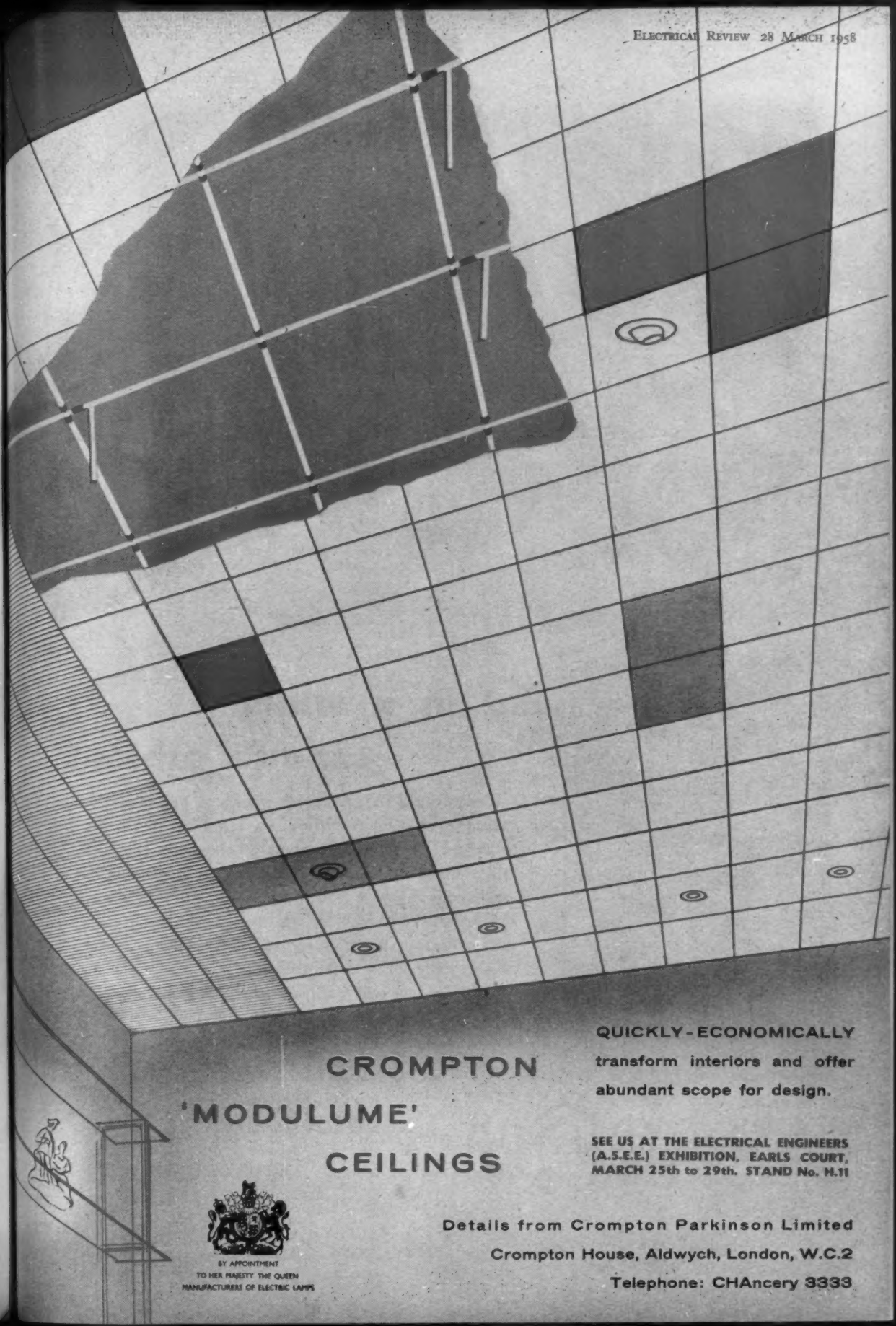

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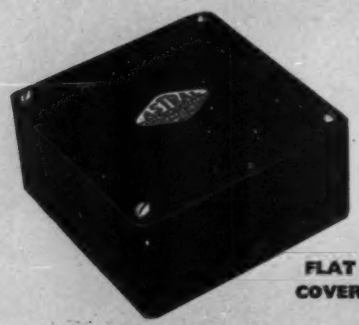

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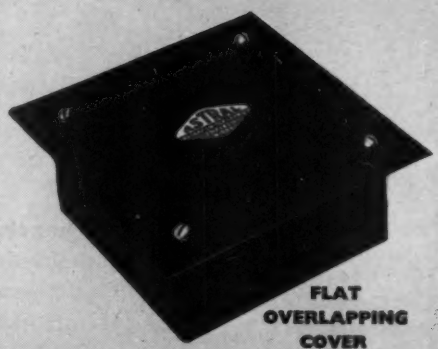

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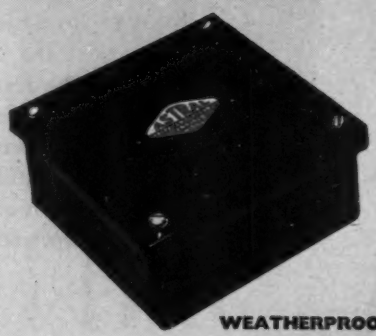

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FLUSH	'FLAT OVERLAPPING'	14 B.G.
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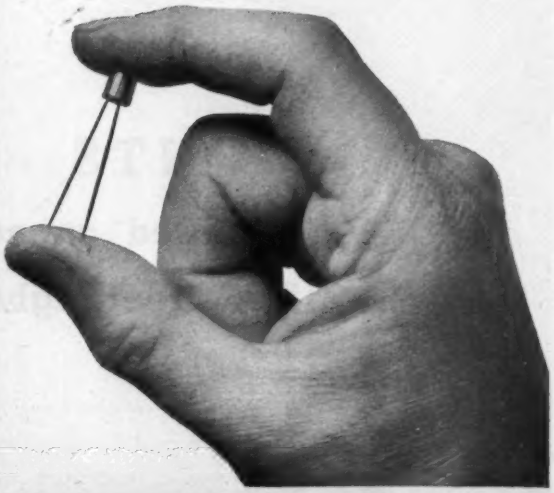

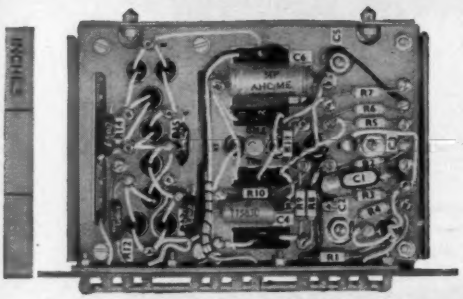

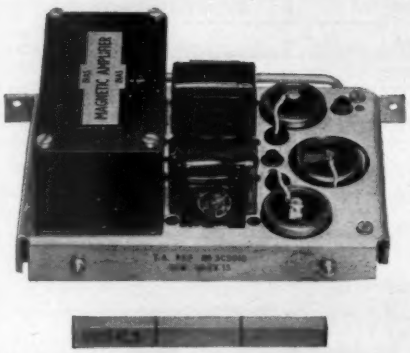

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FE 177/2

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13	,,	ZB203A	4½	2⅛ x 1⅛
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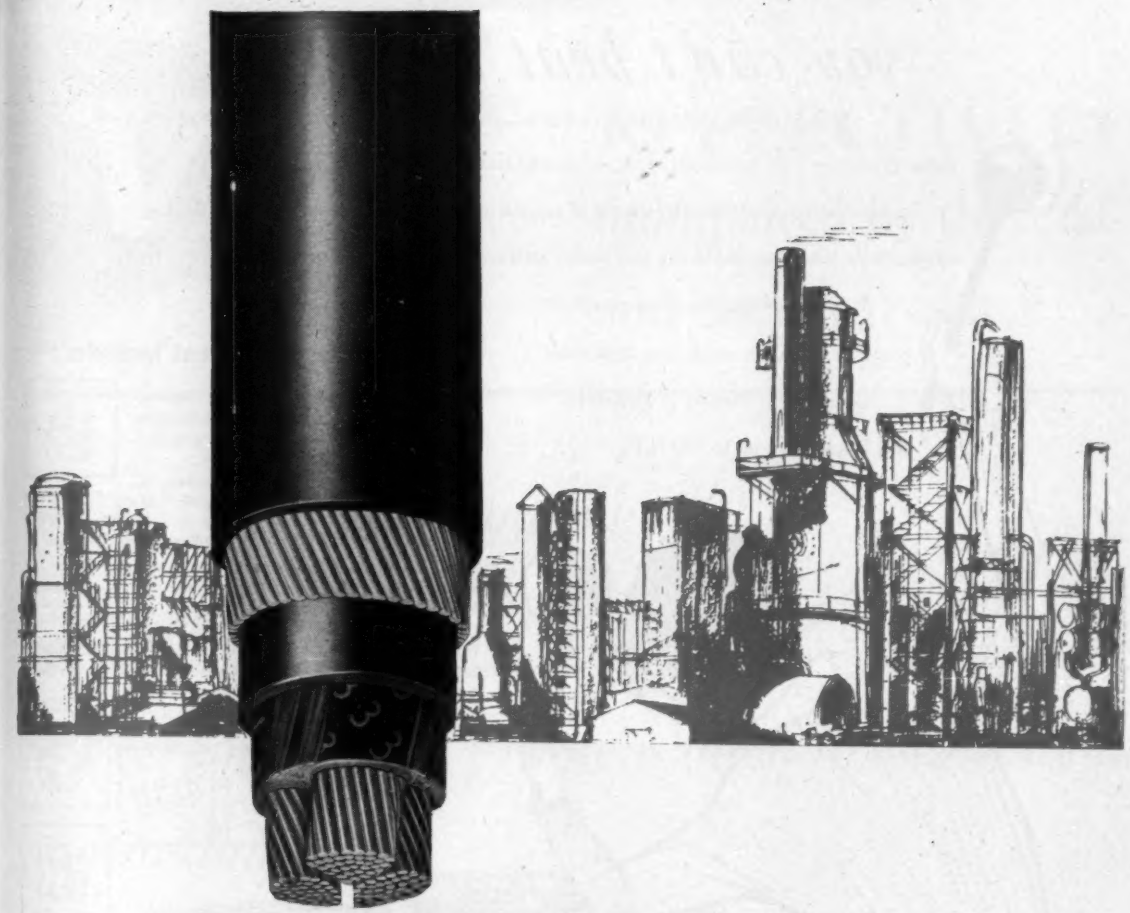

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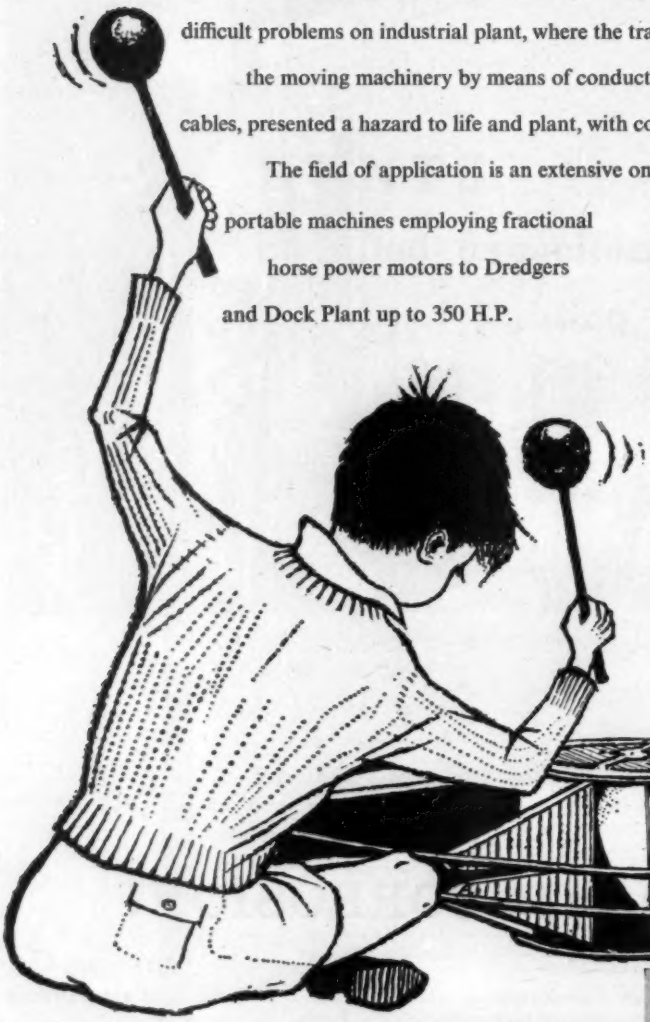

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P.79

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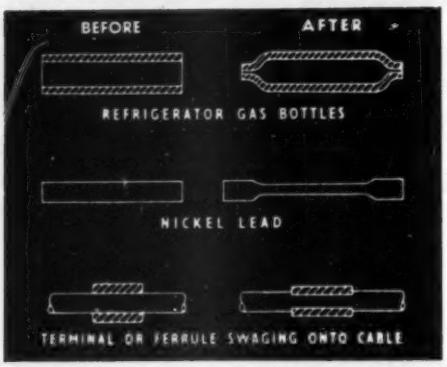

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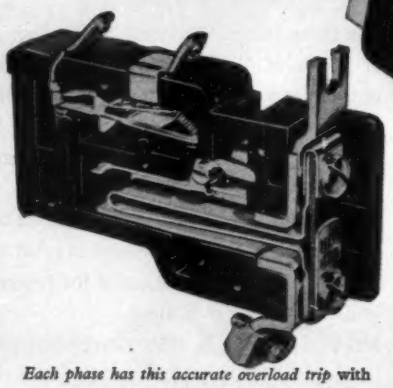

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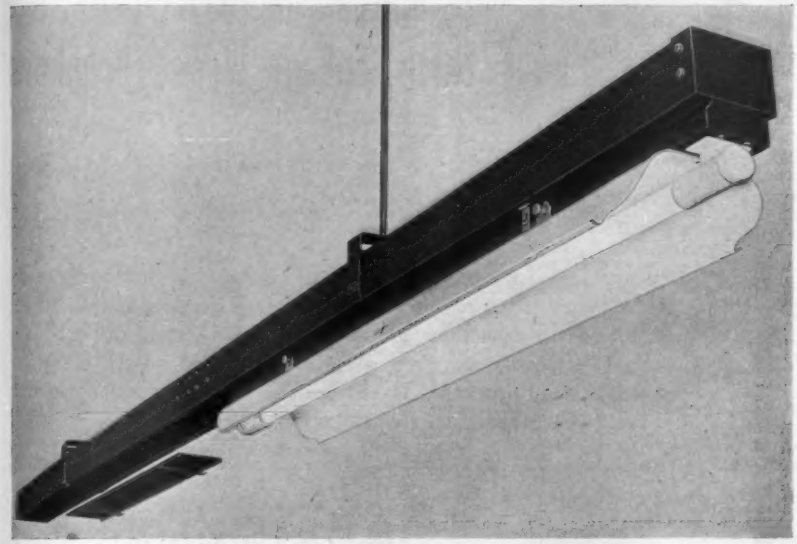

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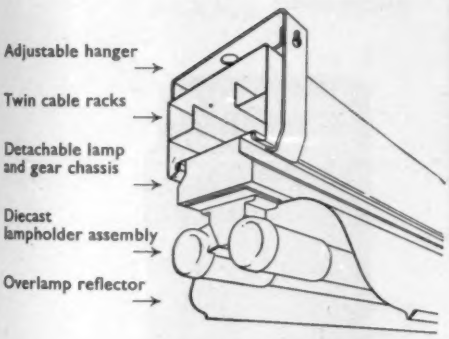

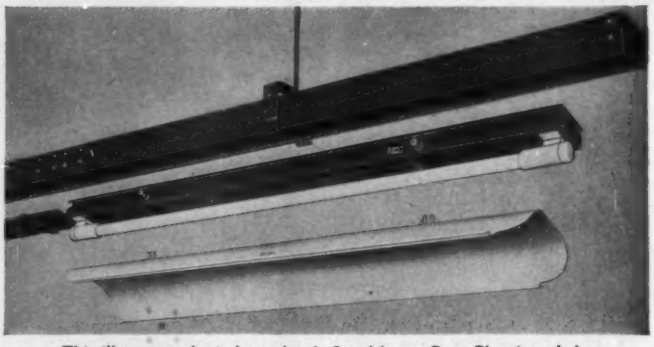

This illustrates the independently fitted Lamp-Gear Chassis and the Detachable Overlamp Reflector. The same size Trunking may be fitted with one, two or three lamp Reflectors for all sizes of lamps.

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28 MARCH
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Progress Under Difficulties 581
The B.E.A.M.A. Council, in reporting the continued advance of the electrical manufacturing industry, mentions the numerous handicaps under which it operates and some of these are commented on

Industrial Substations 583
The greater use of electricity in factories brings to the fore the question of adequate substation facilities. The author includes a useful table giving recommended space for substations of various capacities with allowance for automatic power factor correction plant

Lighting Fittings Makers 586
Speeches at the annual luncheon of the Electric Light Fittings Association contained references to the Restrictive Trade Practices Act and its effects on the fittings branch of the electrical industry

Nuclear Power Development 588
In a lecture to the Royal Society of Arts last week, Sir Christopher Hinton said that if the present pace of nuclear development continued and the trend of coal costs persisted, nuclear power would be cheaper than power from conventional stations by 1962 and less than half the cost in 1982

Bradwell Power Station 589
Photographs show the latest stage reached in the construction of the station, which is being built for the C.E.G.B. by the Nuclear Power Plant Co. For handling the heavy reactor parts a 200 ton overhead girder crane has been brought into use at the site

Electrical Engineers' Exhibition 599
The Exhibition, in which more than 400 manufacturers, associations and organisations are taking part, was opened on Tuesday by the Parliamentary Secretary to the Board of Trade, Mr. F. J. Erroll.

B.E.A.M.A. in 1957–58 601
Further progress was made in all branches of the electrical industry last year. Power plant production and railway electrification have been among the principal activities and export trade again reached a record level

✧ ✧ ✧ ✧

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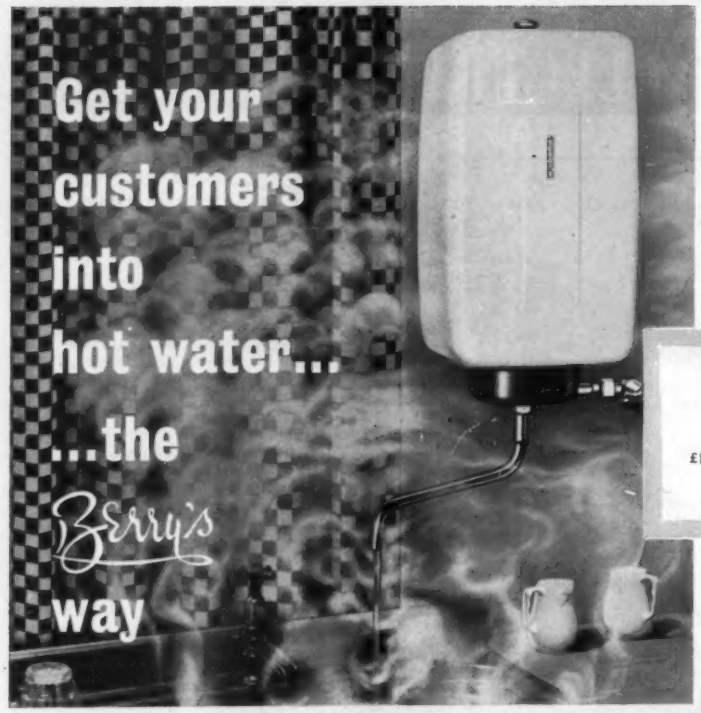
VOLUME 162 NUMBER 13 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home £4 15s 0d; Overseas £5 15s 0d; U.S.A. and Canada $16.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."



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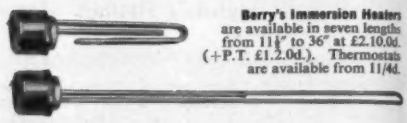

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ELECTRICAL REVIEW

28 March 1958 Vol. 162 No. 13 Established 1872

Progress Under Difficulties

ONCE again the report of the Council of the British Electrical and Allied Manufacturers' Association, reviewed on page 601 of this issue, shows that the electrical industry continues to advance. Indeed, retrogression in a world in which the scope for electrical development is limitless is unthinkable, but, as the report shows, the price of progress is eternal vigilance and constant endeavour in the face of adverse circumstances.

At home the industry enabled the electricity supply authorities to commission nearly 2,000 MW last year and work rapidly proceeded on the first of the nuclear power stations. It is again proudly claimed that the unit capital cost of generating plant is no greater now than it was in 1948, mainly through the production of larger sets; it is hoped to have the 550 MW Thorpe Marsh set in operation by 1963. Parallel with the large production for the home industry, a total of 900 MW of plant was exported. Another direction in which electrical manufacturers are putting forward great endeavours is railway electrification. It is said in the report that this year the rate of output of the firms concerned in this work (who also have large export commitments) will have to be doubled.

About 22 per cent of the electrical industry's output was exported and the total value of overseas trade reached £279 million, comparing with £354 million for the United States and £253 million for Western Germany. But while we still remain ahead of Germany, that country's share of world electrical trade continues to rise while ours has fallen. The B.E.A.M.A. Council shows that this is not because of any lack of effort by British exporters. Many formidable handicaps have to be faced in overseas markets—apart from those encountered at home. It is noted that there is still a regrettably large proportion of British electrical firms who do not export at all. Commonwealth countries still take the largest share of our electrical exports, but the report stresses the importance of our trade with the O.E.E.C. countries which last year took 18·5 per cent of those exports.

This country's economic position has necessitated restrictive measures which bear hardly upon progressive industries. We have said on previous occasions that there is insufficient differentiation between industries which contribute to the country's productivity and export trade and those which are of a less essential nature. This is true both of capital investment control and in the matter of purchase tax, which particularly affects the manufacturers of domestic appliances.

In its references to high taxation, credit restrictions and dear money, the Council expresses the hope that " steps will soon be taken in the interests of long-term progress to relax the restrictions which have been so firmly applied, before the country's economy

has travelled too far along the road to recession." Since that was written the Bank Rate has been reduced but the Government has said that credit restrictions must continue. Can we hope that those restrictions will be applied with greater discrimination?

EUROPEAN FREE TRADE

When the idea of a European Free Trade Area was first put forward all the fears seemed to be on our side. Many people contemplated a flooding of the British market with cheap Continental goods while our own products stood little chance of success on the Continent.

But now that the British Government has committed the country to European Free Trade, progress is being retarded by fears on the part of members of the European Common Market, particularly France. It is difficult to steer a way between the many cross currents, economic and political, but it looks as though France, a high-cost country, wishes to establish safeguards which would be at variance with the principles of the scheme. In the meantime many British manufacturers are "conditioning" themselves in preparation for European Free Trade, a process which necessarily diverts their attention from more immediate things. They should be told soon whether the plan is to be proceeded with or not.

USKMOUTH MYSTERY SOLVED

Through a remarkable feat of detection the cause of the destruction of a 60 MW turbo-alternator at Uskmouth power station a little over two years ago has been cleared up. The thorough examination of all mechanical components analysed by Messrs. A. L. G. Lindley and F. H. S. Brown in their paper to the Institution of Mechanical Engineers, reported in this issue, produced no clue as to why within a few seconds a machine which should have been held within 7 per cent of normal speed on loss of full load should have reached 70 per cent overspeed. Even the usual indications of a runaway were absent.

The combination of circumstances, chemical in their origin, is believed to be unique. The only indication of pending trouble appears to have been some roughness in governing, not unknown in new plant. The authors, nevertheless, draw attention to a need for the development of means of comprehensive testing on load of turbine control devices.

TOO MUCH COAL?

Until quite recently, expert opinion has been that in a very few years' time the amount of coal mined will be quite inadequate to meet the demand. This was one of the reasons for hastening on with nuclear power development in this country. Now, almost suddenly it seems, we are told that there is too much coal and the coal-mining industry is hurriedly endeavouring to apply restrictive measures. It appears that the surfeit is due not so much to increased output as to falling demand, and one panic measure advocated by the National Union of Mineworkers is the compulsory reduction of oil imports.

We had been given to understand that our former customers for coal were being let down because we were consuming at home all we could get. The present position is that those customers have learned to do without British coal and are getting it from elsewhere, particularly the United States with whom some countries have long-period contracts.

What effect all this will have on nuclear development is not clear. The programme has already been "re-phased"; it would be unwise to spread it out any further merely because circumstances have created what is probably a temporary abundance of coal. In his Trueman Wood Lecture last week Sir Christopher Hinton insisted that the demand for coal was still rising far more rapidly than supplies.

PRICES AND SERVICE

Collective price maintenance by manufacturers is now forbidden by law although the position of individual manufacturers in this regard has ostensibly been strengthened by the same measure—the Restrictive Trade Practices Act. Yet it is doubtful whether the trouble and expense to which a manufacturer would be put by bringing price enforcement actions could be justified by results. This was the view put forward by Mr. C. J. W. Scott last week at the annual luncheon of the Electric Light Fittings Association and he quoted the experience of American concerns in support.

Specious arguments can be adduced for freedom in the matter of prices but cut prices too often mean inadequacy or complete absence of service and responsibility. Customers may gain a temporary advantage, but in the long run they obtain greater satisfaction from an industry with an orderly price structure which ensures an adequate, but not excessive, reward for services efficiently performed. That is why we continue to advocate the voluntary adherence of all concerned to the principles of the Electrical Fair Trading Policy.

TECHNICAL MANAGERS

It has been said that the Russians' recent scientific successes have been due to their farseeing emphasis on technical education and the fact that qualified scientists and engineers, who are the most highly paid people in that country, are the industrial managers.

In Britain, non-technical people are at the head of many industrial firms. This may be the reason why some first-class men prefer to take a classical degree. As Lord Hives said in a paper presented to the Institution of Production Engineers recently, "one reason for this is that the technically trained people are so valuable and so precious that they cannot be spared to undertake non-technical jobs where other people are available. This will correct itself as we increase the number of technically trained men."

CLEANERS AND POLISHERS

Next week's issue will include a survey of the range of domestic vacuum cleaners and floor polishers now on the market. As usual, many of the models will be illustrated and details will be given of motor rating, accessories, price, etc.

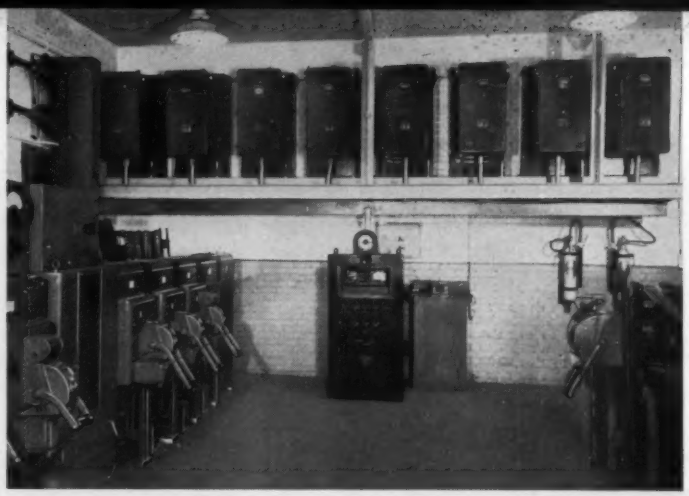


Fig. 1.—A good example of space saving in an industrial substation

DESIGN CONSIDERATIONS FOR SPACE REQUIREMENTS

By G. O. McLEAN, M.Eng.

Industrial Substations

THE greater use of electrical energy for industrial works is the main hope of this country in keeping its place in world markets by increasing productivity. It has been pointed out on many occasions that the cost of electricity bought by industrialists from the supply authorities is only from 1 per cent to 3 per cent of the total works cost, and therefore the amount of thought and planning given to the subject of electricity in the factory has been rather meagre. The amount of capital spent on the switchgear and distribution equipment has been niggardly, while the amount of space for the works substation, from which flows the life blood of the whole factory, has been ludicrously small and sometimes has been fought for inch by inch. Since this state of affairs is caused by lack of thought, the more that is written about it, with examples of good and bad practice, the sooner should this state of affairs be remedied.

Factory space in industrial towns is most expensive, probably running from £1 to £10/sq ft, and the cost of the building over the land is probably ten times the above. The industrialist, therefore, feels that he can only be lavish with space for productive machinery, failing to realise that without electrical energy there would be no production at all. He also has a feeling that the Electricity Board, in asking him for substation space, are carrying out their functions at his expense and inconvenience. It should be realised that a distribution substation feeding into the Board's l.v. network does not require a larger building than one measuring about 20ft by 20ft. It is almost impossible to obtain a piece of land of this size in a built-up area, unless it is part of a large site such as an industrial works. There are considerable advantages in granting the Board substation facilities; for instance, there is no vulnerable equipment between the Board's and the works' substations, thus increasing the security of supply. Though the Board appears to benefit by incurring lower capital costs and having lower losses, these benefits must ultimately be reflected in the tariff to the industrialist.

Space Required

It is, of course, impossible to give a general answer to the question of how much space is required for an industrial substation and how much more space is required if the Electricity Board desire to feed their own l.v. network from the same site. However, it is possible to determine the envelope dimensions of the switchgear and transformers for varying electrical loads and an attempt has been made to do this in Table 1. The need for power factor correction capacitors, assuming that induction motors will form the bulk of the electrical load, has been taken into account. In addition to envelope

TABLE I.—SUBSTATION SIZES

Maximum Demand	Probable H.P. of Motors Installed	Space Required (sq ft)						Total Substation Area Recommended (sq ft)
		H.V. Switchgear		Metering Panel	Transformers	Capacitors	L.V. Gear	
		Supply Authority	Consumer					
100 kW	200	6	6	Wall panel	Nil (l.v. supply)	6	6	70
					18	6	6	150
500 kW	900	6	6	Wall panel	30	20	20	220
1,000 kW	1,800	6	12	6	56 (2 × 500 kVA)	35	30	300
2,000 kW	3,500	6	12	6	120 (2 × 1,000 kVA)	50	40	400
5,000 kW	8,500	12*	18	6	360 (3 × 2,000 kVA)	100	80	800
10,000 kW	17,000	12*	24	8	500 (3 × 5,000 kVA)	180	120	1,400
20,000 kW	35,000	12*	36	8	800 (5 × 5,000 kVA)	320	180	2,000

* Two incoming supplies

dimensions tabulated, a column has been added giving the author's recommendations for minimum overall floor space required.

As expected, the amount of space per kW of demand or per horse-power of motors installed falls off as the size of load increases, but it would be very unwise for an industrialist to limit his space allocation for the substation to that shown against his present demand. Not only is the load likely to increase as productivity increases, but many of the processes may, in the future, be changed over to electrical working. Though the table is self-explanatory, it is necessary to stress that bare envelope dimensions have been given and that for ease of access for maintenance and operation, a 3ft wide space is required around each piece of equipment. A well-designed substation is shown in Fig. 1.

It is clear from the table that transformers take up the greatest amount of space and are, of course, also the heaviest items of equipment and therefore cannot be moved about when once installed. It is probably because of these features that industrial substations have tended to be crowded, as shown in Fig. 2. There is, of course, no need for this, as transformers are completely weatherproof and can be placed out-of-doors. If some weather protection is required for the maintenance staff when carrying out periodical oil filtering or attention to tap-changing equipment, then a semi-outdoor arrangement can be used, as in Fig. 3.

Some industrialists claim that the land in their yard is so valuable that it cannot be spared for a free-standing transformer. Many factories provide car parks for their workers' vehicles and it is often possible to find a corner in which to put the transformers or the whole substation, though cabling costs will be higher than if the substation were located at the load centre. If the substation is small enough, it can be mounted on stilts, as shown in Fig. 4. It has been suggested that stilts could be dispensed with if two of the works buildings are adjacent, with a 20ft or 30ft roadway between them. A few girders between the two buildings at a height, say, of 20ft, would provide a possible site for a substation.

Where the supply agreement includes a clause whereby the Electricity Board use the substation for feeding into their own network, the additional space requirement is usually not greater than required for two 500 kVA transformers, that is, about 300 sq ft (see Table 1). Since the Board's substation would be adjacent to, and probably combined with, the consumer's equipment, additional space would probably be only that for a substation with 1,000 kVA extra capacity above requirements. If the works require 1,000 kW and the Board require 1,000 kVA, the extra space would be 100 sq ft. In the author's opinion this should be easily arranged.

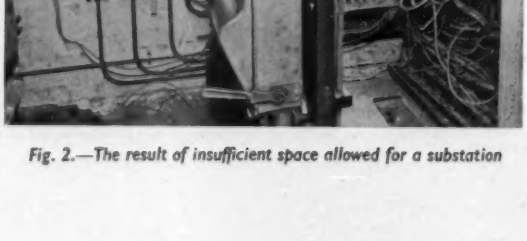


Fig. 2.—The result of insufficient space allowed for a substation

TABLE 2.—ROUTINE MAINTENANCE

Equipment	Minimum Period	Essential Work
Transformers	3 months	Examine for leaks, check oil level, breathers or relief diaphragm.
	12 months	Complete set of oil tests.
	When necessary (probably 24 or 36 months)	Filter oil—lift cover for internal inspection.
Switchgear	Within 24 hours of clearing fault	Examine contacts, test oil, clean up and replace damaged parts.
	3 months	As above—on switches breaking load daily.
	18/24 months	As above—on all switches in use.
Protective Gear	12 months	Use protective circuits to trip breakers. Test continuity and insulation of all auxiliary circuits, check relay settings and if possible arrange injection tests. Change all fusible elements.
Earths	12 months (but daily, if excavation work proceeding)	Check continuity—measure electrode resistances.
Cables and Wiring	12 months	Insulation and continuity tests.

The granting of this small concession by the consumer will probably be repaid many times over by the supply authority, not necessarily by a rental in hard cash, or even a tariff adjustment, but by increased and improved service. For instance, an inspector might be the first to notice a leaky cable box joint or gland on the consumer's switchgear; or the oil in the consumer's transformer or switch tanks may be filtered during the periodic maintenance visit; or again, relays and other protection gear may be tested with the supply authority's special equipment without any charges being made to the consumers.

Power Factor Correction

As already mentioned, the industrialist will be wise, when allocating space for his works substation, to make allowance for the housing of a bank of capacitors. The supply authorities are becoming stricter about power factor correction, but most Area Boards have standardised kVA metering for industrial tariffs and, therefore, do not have to worry about p.f. penalties, as the p.f. of the load will directly affect the charges. On the other hand, the consumer can correct his p.f. automatically and, since he can buy large capacitors at an average price of £3 to £4 per reactive kVA, it is an economic proposition. The capital costs of the equipment are generally repaid in the first two years by the savings on the demand charges.

There are two methods of feeding the reactive kVA into the system to correct the inherently bad p.f. of inductive loads. One method is to arrange for the appropriate size of capacitor to be included in the circuit of each motor, so that it is switched in when the motor is put on load. This method eliminates the need for substation space and the matching of reactive load with rating plate inductive load can be done accurately.

The second method is to have a central bank large enough to correct for the total inductive load but arranged in steps, each separately and automatically switched, so that whatever the works load, the p.f. is corrected to nearly unity. A multi-step control relay is available which consists of an element for measuring reactive VA which closes contacts to complete the circuit of a high torque reversible motor driving a lay shaft through gearing. Rotation of the shaft operates a maximum of 10 mercury

Fig. 3.—1,000 kVA transformer substation well ventilated but covered

Fig. 4.—Small American works substation clear of yard traffic

switches, in sequence. These, in turn, close the circuits of the main contactor coils, thus switching the capacitor units in or out to maintain unity p.f.

It would be unfair to mention two methods without offering some guidance regarding choice of method. Both are completely reliable and automatic, with identical "book" and "actual" lives, but probably the small individual units are easier and cheaper to replace should anything go wrong. The space factor has also been mentioned as a very big advantage of the small individual units where space is valuable. Against these advantages must be set the adverse factor of higher initial cost. Each and every motor or other item of inductive load must have its corresponding capacitor, irrespective of any diversity existing between the running times of motors.

The central bank has only to match the anticipated maximum demand, which in most industrial premises is about 66 per cent of installed load and in some premises with a great number of small motors as low as 40 per cent. To this 30 per cent (minimum) saving must be added another 20 per cent for the difference in price "per kVAr" between the large and small units, so that the total price for an individual unit installation is always, at least, 50 per cent higher than the central installation. Another, smaller, disadvantage of the unit installation is its inflexibility to match the exact load of the motor, where this is of a variable character. There can be over-compensation on light loads and under-compensation on heavy loads, and correct compensation only at a single load.

Fire Fighting Equipment

The industrialist is often in considerable doubt regarding the need for, or extent of, fire fighting equipment in his works substation. Fortunately, fires originating in such stations are extremely rare but most high-voltage apparatus, particularly switchgear, is insulated by means of oil and if a medium-sized transformer were accommodated in the substation, the quantity of this inflammable substance often exceeds 500 gallons.

Too much stress cannot be placed on the statement already made, that the works substation is the heart of an industrialist's factory and, therefore, however small the fire hazard, the maximum protection must be afforded and all normal safeguards taken.

Dealing first with the oil hazard, the simplest and most effective precaution is to arrange for a soak-away pit outside the substation building to which any oil can drain from smaller catch pits under transformer and switchgear tanks, should any of these burst owing to mechanical or electrical stresses. An alternative to the external pit (if space is very limited) is to arrange for the catch pits to be deep enough to contain the full quantity of oil that may be spilt into them, after making allowances for the space occupied in the pit by gravel. The gravel serves to quench and smother any burning oil if a fire starts before an explosion releases the oil.

Small fires caused by accidental short circuits on secondary wiring, or careless handling of blow lamps during maintenance work, can be dealt with by automatic flooding systems or portable appliances, depending on the size of the installation. If the products of the factory are of an inflammable nature (e.g. textiles or paper) and a sprinkler system is in use in the factory, then a "Mulsifyre" system can be installed over the switchgear and transformers. Alternatively, the substation flooding can be done by means of an automatic CO_2 system, again operating by fusible phials strategically placed. If the transformer is situated outside the building and there are only a few switches in the substation, then it may be sufficient to have a few foam appliances placed at strategic points. These should be of adequate size to provide a foam blanket over the largest section of switchgear in the substation and there should be at least one appliance within easy reach of each door.

Small appliances (preferably not less than ½ gallon size) have proved useful in extinguishing very small fires and preventing a large blaze, but some of the substances used for filling these appliances are not safe on electrical fires because of their conductivity, while others produce toxic gases when intensely heated.

This article cannot be concluded without offering some guidance to industrialists who are doubtful about the type and frequency of maintenance jobs which will help to ensure complete reliability. The writer has found that

industrialists experience difficulty in reconciling the conflicting advice of different manufacturers, some claiming that no maintenance is necessary and others suggesting inspection after a very small number of operations. The writer suggests that the supply industry have naturally had the widest experience in these matters and their local engineers will gladly advise industrialists on their own schedule of maintenance work and routine tests and, as hinted above, probably be prepared to help with specialised equipment. The availability of equipment for routine checking and maintenance work is dictated by the works production programme, but many of the routine items can be accomplished in a few hours and the most protracted ones at a week-end. The principal items to be watched are the insulation values and all insulating materials, from the oil in transformers and switches, to the covering of small and large conductors. To ensure this, the equipment must be tested periodically and a guide to the time between tests is given in Table 2.

The author gratefully acknowledges the help he has received from the North Western, Midlands, and South Western Electricity Boards, the English Electric Co., Ltd., the Metropolitan-Vickers Electrical Co., Ltd., and British Insulated Callender's Cables, Ltd.

LIGHTING FITTINGS MAKERS

Benefits of Association Methods

AT the annual luncheon of the Electric Light Fittings Association last week at the Piccadilly Hotel, London, the chair was taken by Mr. C. J. W. Scott, the president. Mr. D. Bellamy, in the capacity of chairman of the British Lighting Council, proposed the toast of the Association whose members, he said, had transformed lighting in this country. The organisation offered an example to the nationalised industries. While keen competition kept members on their toes they were still able to meet amicably to discuss matters of common interest. He had the greatest sympathy with people who had to meet customers' varying needs; it was a difficult business but they had done extremely well. He would not suggest that the lighting fittings makers should close down some competitive establishments and he would not tell them that they could improve their load factor by keeping their offices open at night. It was said that competing gas and electricity showrooms were costly to the taxpayer, but that was quite untrue because they were run on business lines and the industries did not call upon public funds.

Everybody in the industry was conscious of the good work done by the Lighting Service Bureau; in this connection he paid a tribute to Mr. W. J. Jones. The British Lighting Council, which represented electrical manufacturers, electricity supply and other branches of the industry, was satisfied that this work should continue and it was taking over and extending the Bureau's activities. New premises were being secured, district committees were being extended and five regions were being set up. He hoped that the Council would be in contact with consumers at every service centre. There was a large untilled field and he called for the co-operation of all electrical organisations in carrying out this work for the benefit of the consumer. In a reference to the work of Mr. C. J. W. Scott, Mr. Bellamy said that he was a live, intelligent and active man and men mattered more than measures.

In his reply Mr. Scott said that the British Lighting Council could not have had a better chairman than Mr. Bellamy whose methods were considerate but efficient; he might perhaps be described as a " rubber steam roller." In spite of conditions, including a 2 per cent fall in building activity last year, no member of the Association had suffered a loss of business. Expansion continued, though at a lower rate; he thought this to be merely a " pause for breath " and the advance would continue. It was a weakness that exchange of statistics between members was not better; this was an essential thing and he hoped for improvement.

Referring to the Restrictive Trade Practices Act, Mr. Scott said that, with minor modifications, they had registered all their practices and continued to follow them. He thought that the benefit of the ability of individual manufacturers to enforce maintenance of their prices was illusory. So far no electrical manufacturer had taken any action. Too much time was occupied by endeavours to maintain prices and American manufacturers were beginning to abandon price enforcement. But if British manu-

At the top table (left to right): Col. B. H. Leeson, Mr. D. Bellamy and Mr. C. J. W. Scott (president); Mr. Felix Rogers and Mr. Scott; Mr. V. J. Stock and (speaking) Mr. H. L. Smith

facturers were left to fight for themselves without the support of other sections the industry would begin to slide down a slippery slope. He did not think that the customer benefited from price "freedom." Organised sections of the industry should put over the strong arguments for fair trading and find methods of assisting and co-operating with manufacturers.

Mr. Scott then mentioned that this was the last occasion on which Mr. Felix Rogers was appearing as director of the Association, although he was not yet retiring from the B.E.A.M.A. He had been director since 1938 and now was relinquishing the position because of the pressure of other work and in order to give opportunities for younger men. He asked Mr. Shepherd, the assistant secretary, to unveil a television set which was the Association's parting gift to Mr. Rogers.

Mr. Rogers, in expressing his thanks, recalled the immediate pre-war and wartime period when the Association had finally succeeded in persuading the Government that it was a necessary organisation and had secured supplies of steel for its members. They were still handicapped by purchase tax imposed purely as a wartime measure.

Mr. H. L. Smith proposed the health of the guests in felicitous terms and in a response Mr. V. J. Stock, vice-president, N.E.C.T.A., Ltd., said that utter chaos would exist in the electrical trading field were it not for the Associations. The E.L.F.A. had loyally supported the Electrical Fair Trading Council which had done much not merely to maintain prices but to enable the industry to expand in a logical and practical manner with a reasonable reward for effort. There was a tendency towards changing the structure of the electrical industry, but that laid down by the Fair Trading Council was eminently satisfactory. It gave manœuvrability and enabled products to be sold at reasonable margins. Mr. Stock concluded by saying that the electrical contractor and retailer was responsible for fixing the fittings and ensuring that they worked; he could not exist on 5 per cent and they should try to squeeze a little more for him.

Annual Report

The report for 1957 prepared by Mr. C. J. W. Scott says that the Restrictive Trade Practices Act has engendered much uncertainty among trade organisations such as E.L.F.A. regarding the future of their stabilised trading arrangements. The effect of this uncertainty has been to cause some manufacturers who have been strong supporters of organised trading to seek to reduce the scope of their associations' trading arrangements or even to resign.

The Association intends to continue its trading codes and related arrangements although it is willing to make whatever alterations that may be necessary to meet changing conditions. It suggests that wholesalers and contractors should consider the difficulties they would face if the codes and the stability which they give to the lighting industry did not exist. Collective enforcement of retail prices and terms is now illegal but each manufacturer may enforce his own resale prices. In the new trading codes the Association has included a statement that resale price maintenance is a condition of sale of each E.L.F.A. manufacturer. It is hoped that it will not be necessary for individual manufacturers to take action to enforce the maintenance of their prices, which would entail much care and consume costly executive time.

Mr. Scott lays stress upon the importance and usefulness of the Association's Technical Committee and its sub-committees which have contributed substantially to the promotion of standardisation and good design. A great deal of research has been carried out in members' laboratories, including the study of methods of measuring the operating temperature of fittings, tests for dust-tightness and the effects on fittings of using shorter g.l.s. lamps. The scope of the technical work has been extended by the inclusion of auxiliary gear among the products covered by the Association. E.L.F.A. representatives played an active part in international technical meetings in Stockholm and Moscow.

Reference is made in the report to the European Free Trade Area proposals. Arrangements are being made for the collection of information about Continental products and markets and other relevant information. Finally, the Association warmly welcomes the formation of the British Lighting Council and the Lighting Equipment Development Council and wishes them success.

NEW BOOKS

Worked Examples in Electrotechnology. By A. C. Shotton, B.Sc., A.M.I.E.E. Pp. 240; figs. George C. Harrap & Co., Ltd., 182, High Holborn, London, W.C.1. Price 12s 6d.

Practice in the solving of numerical examples is an essential part of the training of an electrical engineer, partly as a means of understanding more thoroughly the theory involved and partly as a discipline in how to express a calculation intelligently so that it can be understood by anyone who may have to check that calculation. Those who have had experience in marking examination papers know only too well the difficulty frequently found in following the candidates' reasoning; and in industry it is very important that any calculation should be set out in a form that can be easily understood.

In the book under review, Mr. Shotton has performed splendid service by demonstrating how numerical problems should be tackled and the answers expressed in an orderly manner. Many of the questions have been taken from S2 and S3 papers of the examining unions and some from the Applied Electricity papers of the University of London. About two-thirds of the book is devoted to the theory of single-phase and three-phase circuits, transformers, alternators and electronics. The remainder of the book deals with electromagnetism, electrostatics, d.c. machines, d.c. distribution systems, illumination and measurements.

Considerable use is made of circuit and vector diagrams, and the text is commendably free from typographical errors. The author might do well to reconsider his solutions to the last part of Question 2 on page 178 and to Question 10 on page 189. In the latter solution he has assumed that the e.m.f. generated in a shunt generator is the same when the machine is loaded as it is on no-load.

At the end of each chapter there are numerous exercises with answers, and any student who has read the worked problems and solved these exercises will have acquired an excellent basis of fundamental theory and learnt how numerical answers should be set out on paper.—E.H.

Synthesis of Passive Networks. By Ernst A. Guillemin. Pp. 730; figs. Chapman & Hall, 37, Essex Street, London, W.C.2. Price 120s.

Synchronous Motors and Condensers. By D. D. Stephen. Pp. 500; figs. Chapman & Hall, Ltd. Price 60s.

A Guide to Plastics. By C. A. Redfarn. Pp. 150; figs. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 18s.

Extrusion of Plastics. By E. G. Fisher. Pp. 114; figs. Iliffe & Sons, Ltd. Price 21s.

Instrument Encyclopedia. Compiled by Edward W. Battey. Pp. 292. The Herbert Publishing Co., Ltd., 36, Southampton Street, London, W.C.2. Price 63s.

Off-Peak Electric Space Heating. By Leslie Shepherd, B.Sc.(Eng.), M.I.E.E. Pp. 40; illus. John D. Troup, Ltd., 90, High Holborn, London, W.C.1. Price 6s.—This is a series of six articles on the subject reprinted from the *Industrial Heating Engineer*.

Nuclear Power Developments

SIR CHRISTOPHER HINTON'S LECTURE TO THE ROYAL SOCIETY OF ARTS

IN the Trueman Wood Lecture on "Industrial Power of the Future" which he delivered to the Royal Society of Arts on 19th March, Sir Christopher Hinton, K.B.E., F.R.S. (chairman, Central Electricity Generating Board), briefly reviewed the steps which led to the commissioning of the Calder Hall power station and spoke on the future of atomic energy.

After describing the operation of graphite-moderated gas-cooled reactors and referring to the programme of construction of power stations employing this type, Sir Christopher said that the estimated cost of power to be produced by the first two nuclear power stations of the Central Electricity Generating Board was 0·66d/kWh. That was higher than the cost of power from conventional steam stations so that the nuclear stations must be justified not by what they themselves achieved but rather by the developments which they were likely to lead to.

In terms of real money values, the capital cost of power plants using conventional fuels had come down steadily and their efficiency had risen. More than anything else this reduction in the cost of steam power plants had been linked with the rise in the initial temperature which it had been possible to achieve in the steam cycle. The limit had been imposed by different factors at different times; in the earliest days, it was controlled by the pressure which could safely be sustained in cast-iron vessels; later it was limited by the performance of cylinder lubricating oils, but for the last forty years it had been controlled mainly by the metallurgy of the materials available for superheater, steam pipe and turbine construction.

The most important advance which was made when Calder Hall was being designed was to use a magnesium alloy as the canning material instead of aluminium. Uranium and magnesium did not form an inter-metallic compound, and one of the most serious possibilities of failure in the fuel elements was therefore eliminated. It was this change to magnesium canning, and growth of knowledge in other directions, which enabled the operating temperature to be raised to the level adopted at Calder Hall, which was sufficiently high to enable use to be made of the heat of fission to generate electrical power. In the reactors of more recently designed stations still higher temperatures had been adopted.

Higher Temperatures

If nuclear power plants were to continue to improve the temperatures must continue to rise. It was towards this end that a very large part of the research programme of the Atomic Energy Authority was directed. The use of higher temperatures would give rise to many other problems. For instance, the cooling gas was at present carbon-dioxide, and this reacted chemically with the graphite moderator at high temperatures. The rate of reaction might be accelerated by the intense neutron bombardment of the graphite in the reactor; it could possibly be alleviated or cured by the use of graphite which had been chemically treated with an immuniser.

Higher temperatures also induced problems in connection with the construction of the pressure system. Because the main pressure vessels had to be fabricated on site by reason of their large size, the steel of which they were made had to have characteristics which made it immune from brittle fracture. But, in order to withstand high operating temperatures it had also to have good creep resistance. The problem of selecting suitable steels thus became more acute as the temperature rose; it might be solved by evolving new steels having the special characteristics required, or by adopting engineering layouts which would ensure that the pressure casing was not subjected to the full temperature of the gas leaving the reactor.

As higher temperatures in nuclear reactors, and therefore higher initial temperatures in the heat cycle which was used for generating power were achieved, higher steam pressures would be used; this would reduce (for a given power output) the physical size of the boilers and turbines and lead to higher thermal efficiencies.

Heat Extraction Rate

Simultaneously with these developments increases in the rating of the fuel elements could be expected, that was to say in the rate at which heat could be extracted from each ton of reactor fuel. If this rating could be doubled the capital cost of this particular section of the power plant would be halved.

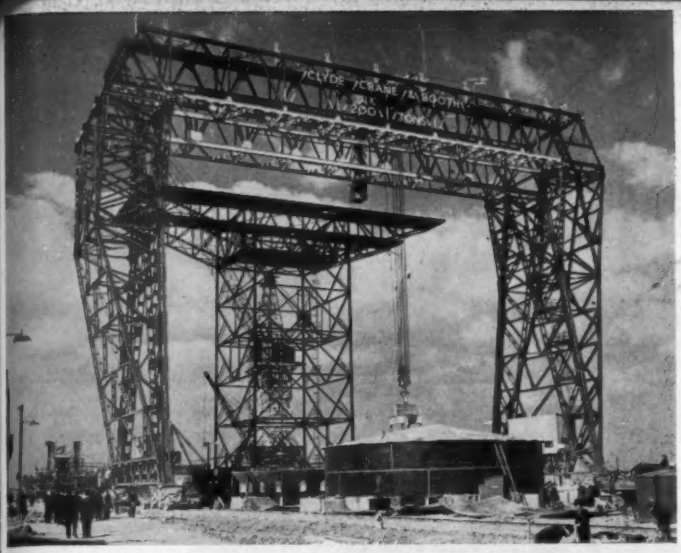
The ratings which had been achieved in the past had been determined by the ability to get heat away from the surface of the fuel element into the cooling gas. The point was now being reached at which the specific rating was determined not so much by ability to conduct heat away from the surface of the fuel element as by the conditions in the centre of the element. The heat generated through the whole cross-section of the fuel had to be conducted from the centre of the element to the surface from which it was removed. Thus, there must be a temperature gradient across the element and the temperature at the centre must be high enough to give the necessary rate of heat flow. As the temperature gradient rose the centre temperature became dangerously high. This could be remedied to some extent by using elements of smaller cross-section, but ultimately the solution lay in the use of ceramic fuel elements.

The use of ceramic fuels made it necessary to enrich the fuel. But enriched fuel elements, using a costly material such as beryllium for canning, would be justified only if high burn-ups could be achieved.

If the development of nuclear power stations continued at its present pace and if the present trend in coal costs persisted, nuclear power would be cheaper than power from conventional stations by 1962, and by 1982 it would be obtained at less than half the cost. Such an achievement would not only make a great contribution to industry generally, but it would induce a change in practice in domestic heating and heat from nuclear energy in the form of electricity would be used in the home.

I.E.S. Golden Jubilee

WE learn that the Illuminating Engineering Society proposes to hold a golden jubilee commemorative dinner at the Criterion Restaurant on 9th February next year, which will be exactly fifty years from the day the Society was founded. It is intended to relay the speeches to the Society's centres throughout the country which will be holding their own functions simultaneously.



BRADWELL POWER STATION

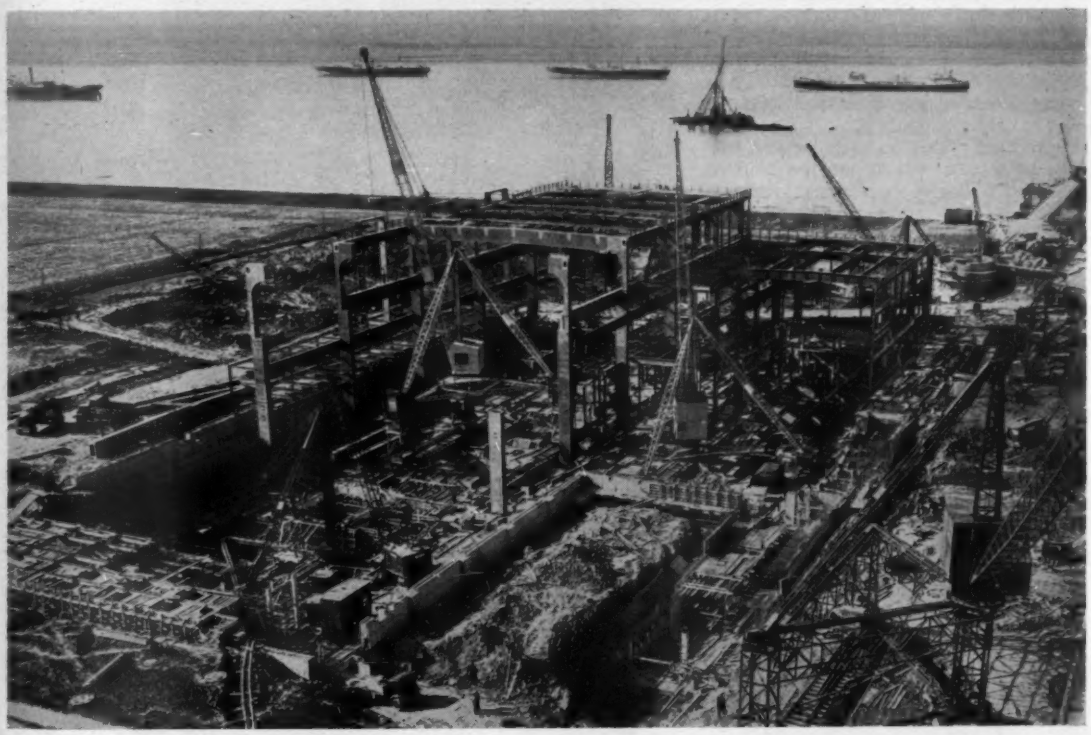
COMMISSIONING OF THE GOLIATH CRANE

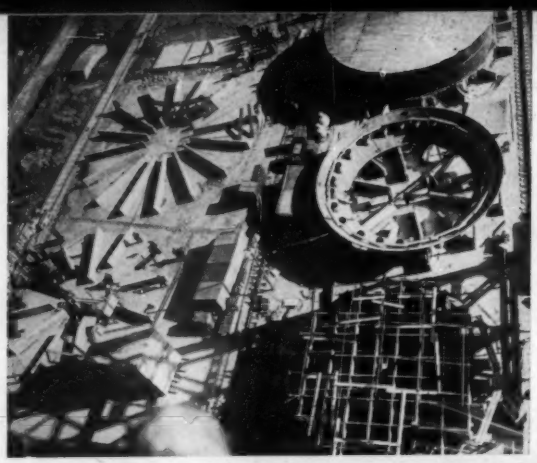
WORK on the site of the commercial nuclear power station at Bradwell-on-Sea, Essex, started in January, 1957, and initially concentrated on the excavations for the two reactor buildings and the turbine house. The station will employ two graphite-moderated, gas-cooled reactors and when commissioned, in late 1960, will have a net electrical output of 300 MW. In each of the reactor buildings there will be six boilers, or heat exchangers (87ft high by 19ft diameter) and a spherical steel pressure vessel (67ft in diameter) which will contain the graphite core and uranium charge. The boiler shells, each weighing nearly 200 tons, will be floated down the North Sea to Bradwell from the factory of Head Wrightson & Co., Ltd., of Thornaby-on-Tees. The reactor pressure vessel, however, is of such size and weight (11,000 tons) that site fabrication is the only feasible method of economical erection.

The main problem was to provide suitable means for lifting into position major components such as the twelve 200-ton boiler shells and the heavy steel ring segments for the reactor pressure vessels, allowing at the same time engineering work in the reactor buildings to proceed without hindrance or delay.

The answer was provided by the "Goliath" crane and

The rate of progress on the Bradwell nuclear power station site is clearly indicated in this picture, taken last week, which shows part of the framework of the turbine house





Concrete platforms on which the final assembly of sections of the pressure vessels is carried out before removal by the Goliath crane to the reactor site

last week we had the opportunity of visiting the site at Bradwell and seeing the crane in operation for the first time.

The crane, which has taken 14 months to build, is of the overhead girder type supported at each end by legs mounted on wheeled bogies. Its size, 177ft high by 178ft between rail centres, will enable it to completely straddle each reactor building during all stages of construction. It is designed for lifting a maximum load of 200 tons and has a vertical clearance of 140ft. An auxiliary hook (30 ton load) is also provided. The electricity supply for the crane is 460 V d.c., generated by a Crossley type "H.S.N." diesel engine generator set which develops 400 b.h.p. at 600 r.p.m. It is direct-coupled to a Clarke Chapman 200 kW generator. A separate engine-driven set provides compressed air for starting the main engine and supplies air at 250 p.s.i. to an air receiver mounted on the wall of the engine room. The engine room itself is a self-contained unit with built-on fuel and water tanks and is arranged for mounting in one of the legs of the crane, some distance above track level.

The crane is mounted on two pairs of 16-wheeled bogies on each leg and the rate of motion with a 200 ton load is 50ft/min. Each pair of bogies is driven by four 20 h.p. motors. The load from each leg is transmitted through a main equalising beam which spreads the load to two other equalisers; these, in turn, are connected to the bogies. The attachment to the bogies is through a universal connection, thus giving equal distribution of load over all the axles in any one leg. Half the total number of axles, i.e. four in each leg, are driven through worm and spur gearing with coupling rods for transmitting the drive from the geared axle to its mating axle in the same bogie. An indicator synchronised by "Selsyn" control is provided so that the driver in the crane cabin can see to what extent bogies at opposite ends of the tracks are being maintained in line; provision is made for driving one end of the crane separately if it becomes necessary to re-align the crane.

The operating speed of the motion hoist, with a 200 ton load, is 4ft 9in/min and of the auxiliary hoist, with 30 ton load, is 33ft/min. Each is operated by two 50 h.p. motors. Automatic solenoid brakes are fitted to each hoist and the speed of lowering is controlled electrically. Two solenoid brakes are fitted to the transverse motion to hold the crab in position and there are eight brakes on the travelling motion to hold the crane when at rest. Normal braking is obtained by plugging through the controllers.

Control System

The crane is operated from a cage which travels with the crab. Each motion is capable of independent operation by means of a master reversing controller which operates magnetic contactor gear. The speed of lowering on each hoist is governed by potentiometer dynamic braking and the rating of the resistances is such that the full load can be lowered the full length of travel of the hook once per hour. Protection is provided against over-current and low voltage.

The first major lift, which will be part of a reactor, is scheduled for the end of April and it is estimated that use of the crane will eventually reduce the time taken to construct the station by between three and six months. When the station is completed the "Goliath" will be dismantled and eventually re-erected on another nuclear power station site.

The crane was designed and constructed by Clarke, Chapman & Co., Ltd. (a member company of the Nuclear Power Plant Co., Ltd.), in collaboration with Clyde Crane & Booth, Ltd., and the Tees-Side Bridge & Engineering Works, Ltd.

A view of the two reactor beds now under construction

VIEWS on the NEWS

By REFLECTOR

LAST week's *Economist* contained the first instalment of a review of the new organisation of the electricity supply industry, an organisation which even some electrical people do not fully understand: hence the explanatory chart which was published in the *Electrical Review* of 14th March. While most of the views expressed in the article are unexceptionable I find it strange that the *Economist* should say that the 1957 Electricity Act "neatly separated the functions of generation and bulk transmission of nationalised electricity in Britain from that of its retail distribution." Actually, of course, that separation was brought about by the 1947 Act which set up the British Electricity Authority to control generation and main transmission and the Electricity Boards to carry out the "retail" distribution. In point of fact the germ of this process originated much earlier when the 1926 Act was passed, providing for the establishment of the Central Electricity Board to control generation and construct and operate the grid.

* * *

Much ado about odd halfpennies has been created by a Birmingham customer of the Midlands Electricity Board. He received a quarterly bill for £2 12s 6d, but he told the Board that this should have been £2 12s 5½d and he asked for a refund of the halfpenny. The Board replied that its electronic accounting system could not deal with halfpennies; it sent the consumer a halfpenny stamp. Then the consumer pointed out that he had been overcharged on a previous occasion and so the Board sent him a 1½d stamp, putting this right and anticipating the next two quarters. The consumer, who is Scottish, holds that "robbery is robbery, whether committed by an electric machine or otherwise." He reckoned that the Board was collecting £5,000 a year to which it was not entitled. A Board "spokesman" is reported to have said that any consumer would be refunded an overcharged halfpenny if he claimed it. I should think that the Board would avoid a great deal of trouble and expense by forgoing these odd coppers—if its "electronic machine" can be suitably adjusted.

* * *

There are perfectly logical reasons for the electricity two-part tariff which do not apply in the case of gas. Yet the gas industry merely, it seems, to keep abreast of electricity, has had a two-part tariff for some years. One gas consumer at least does not like it. He is served by the North Thames Gas Board which supplies gas at a flat rate of 25·85d/therm or on a two-part rate consisting of a standing charge of £1 12s a quarter plus 19·94d/therm. This, says the consumer in a letter to the *Manchester Guardian*, gives a break-even point at about 65 therms. He wants to know why the Board cannot charge 25·85d/therm for the first 65 therms consumed and then 19·94d/therm. This, of course, is the block tariff which the Electricity Boards are now using and for both gas and electricity it seems to be the better method.

* * *

Contrary to my first impression, an advertisement headed "Animal Technicians" in the *Evening Standard* the other day was not a desperate attempt to meet a shortage of which we are continually being reminded nowadays. It proved to relate to the desire of some producers of medical requirements to secure people experienced in handling a variety of animals. But still the heading raised interesting possibilities.

* * *

The *Sunday Dispatch* professes to have discovered a shockproof electrician and says:—

> "Give him a bare wire to hold, switch on—and he merely grins." The kind of electric jolt that throws a normal man three feet into the air just gives the 68-year-old master tradesman a slight tickle . . . [He] believes that he has built up a tremendous resistance by constant work on electrical installations over the years."

A reader who has sent me a cutting of this news item is rather indignant. He considers that the publication of such matter is "virtually murderous as it is likely to encourage youngsters to take risks." He says that in his long experience he has met far too many "volt-proof" men who have been severely shocked and burned after "getting away with it" for years.

* * *

Paper is the basic insulation for electric power cables nowadays and its use for this purpose dates from the 'eighties of the last century. The *Electrical Review* of 30th March, 1888, described a method devised by Weber and Schefbauer in the following terms:—

> "Two or more copper conductors are placed parallel to one another at a convenient distance, and are covered with several layers of paper tapes which have been passed through a bath of ammoniacal oxide of copper. The paper covering thus obtains an outer coating of cellulose, and by passing the core through rollers of the proper shape, the cellulose on one spiral combines with the neighbouring spirals, forming a solid mass. During the passage through the rollers the conductors are carefully guided, so that they cannot come into contact. The core is again passed through the bath, the cellulose, to a certain depth, being thus detached, and it is then taken through rollers heated by steam and exercising considerable pressure; the core comes out dry, and with a smooth surface. A third bath in boiling linseed oil is given, the core being heated so as to allow the paper to thoroughly absorb the oil; finally the rollers are again employed so as to expel any excess of oil. It is claimed that conductors thus treated form a pliable and elastic cable, and that the presence of moisture is rendered impossible."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. H. Foster-Smith, M.C., M.I.E.E., has been appointed by the United Nations to give technical assistance to the Paraguayan Government on power plant and distribution extensions to the electricity supply systems of the country. Under the U.N. technical assistance programme for undeveloped countries, he has carried out similar work in India and Venezuela. He left by air for Asuncion, Paraguay, on 17th March. Mr. Foster-Smith is a Birmingham-trained engineer and was with the C.E.A. at Worcester, Birmingham and Bankside (London).

The Telegraph Construction & Maintenance Co., Ltd., announces the appointment to the board of **Mr. H. F. Wilson,** B.Sc., A.R.I.C., A.I.R.I., F.R.S.A., Companion I.E.E., F.P.I., and **Mr. C. L. G. Fairfield,** M.A., M.I.E.E., A.M.I.Mech.E., Barrister-at-Law.

Mr. Wilson will presently assume the appointment of managing director of the Telcon Cables group. He was educated at the City of London School and London University where he obtained an honours degree in chemistry. He joined the Telegraph Construction & Maintenance Co., Ltd., in 1919, and was appointed chief chemist in 1945 and technical manager in 1948. He subsequently headed the company's Plastics Division when it was re-formed in 1953 as a separate unit at Farnborough Works, Kent. In 1956 he was also appointed works manager of the cable factory at Greenwich, and ultimately assistant managing director of the Telcon Cables group in 1957. Mr. Wilson is also a director of several Telcon subsidiary and associated companies. In 1953-55 he was chairman of the Council of the Plastics Institute.

Mr. Fairfield, who has been appointed commercial director of the Telegraph Construction & Maintenance Co., joined the company in 1953 as manager of the Overseas Division, and was soon appointed general sales manager for the company and Submarine Cables, Ltd. He is a director of Telcon Enterprises Overseas, Ltd., and Toolpro, Ltd., two subsidiaries of the Telcon group of companies. After taking an honours degree in mathematics and mechanical science at Cambridge in 1933, Mr. Fairfield served an apprenticeship with, and was on the staff of, the Metropolitan-Vickers Electrical Co., Ltd. He held several positions with the former Central Electricity Board between 1937 and 1945, and was subsequently with Balfour Beatty & Co., Ltd., for two years. From 1947 to 1953 he was with Mullard, Ltd., for a period as secretary of the group and latterly as manager of the Valve Division.

Mr. H. F. Wilson

Mr. C. L. G. Fairfield

Mr. D. L. Tabraham, M.A.(Cantab.), F.I.E.S., has been elected president of the Electric Light Fittings Association, in succession to **Mr. C. J. W. Scott,** who becomes vice - president. Mr. Tabraham is manager of the Lighting Fittings Department of the General Electric Co., Ltd., having formerly been in the company's research laboratories. He has been chairman of the Industrial and Commercial Fittings Section of the Association for the past four years and for several years has represented E.L.F.A. on the Electrical Fair Trading Council, the National Illumination Committee of Great Britain and the B.S.I. Illumination Industry Standards Committee.

Mr. D. L. Tabraham

The Cambridge Instrument Co., Ltd., has announced the following appointments:—**Mr. L. F. Cooke,** previously head of the Industrial Sales Department, has been appointed commercial sales manager; **Mr. A. T. Jones** has been appointed sales manager of the Mechanical Thermometer Division at Finchley; and **Mr. S. A. Bergen,** M.B.E., M.I.E.E., has been appointed chief development engineer of the Cambridge organisation.

Mr. J. C. Williams, A.M.I.E.E., has been appointed engineer for the Central Sub-Area (covering Cardiff and East Glamorgan) of the South Wales Electricity Board in succession to Mr. J. F. Wright, whose appointment as deputy chief engineer to the Board we recently reported. Mr. Williams commenced his service in the industry in 1928 with the former Cardiff Corporation Electricity Department where, after service in several sections, he was appointed assistant mains engineer. In 1946 he was appointed mains superintendent in the former Rawtenstall Corporation Electricity Department and two years later he returned to South Wales to become the Board's district engineer for Newport.

The following appointments and changes have recently become effective in the Hoover Sales Service organisation:—**Mr. J. R. Taylor** has been appointed district manager at Norwich; he was formerly area manager in the Leicester district. **Mr. A. F. Woodward** has resigned his post as district manager at Oxford and **Mr. P. R. Goode** has transferred from Norwich to be district manager at Oxford.

W. T. Glover & Co., Ltd., have appointed **Mr. J. A. Osbourne** to be assistant district manager, Birmingham office, rubber and thermoplastic cables. He was previously a sales representative at the Liverpool office. **Mr. R. D. Horne** has been appointed assistant manager (mining sales) at the head office and works, Trafford Park. Mr. Horne's previous appointment was as assistant district manager, rubber and thermoplastic cables, Birmingham office. The appointments operate from 31st March.

Mr. R. S. Wren has been appointed London manager within the southern sales area of Ekco - Ensign Electric, Ltd. Mr. Wren, who has been associated with the electric lamp and lighting industry for the past 32 years, joined Ekco-Ensign last October. He was previously with Pope's Electric Lamp Co., Ltd.

Mr. R. S. Wren

Now that quantity production of arc resistant electrical insulation materials has commenced and the installation of specialised production equipment has been completed, Rosite, Ltd., Cheney Manor, Swindon, has appointed **Mr. B. W. Hymass** as manager and **Mr. J. G. Selby** as sales manager of the company. Mr. Hymass has previously spent eleven years with the components division of the Plessey Co., Ltd., and Mr. Selby was formerly sales manager of Insulators, Ltd. Rosite, Ltd., was recently formed by the

Mr. B. W. Hymass

Mr. J. G. Selby

Plessey Co. and Rostone Corporation, Indiana, U.S.A., to manufacture cold moulded plastics made of Rosite, an inorganic plastic, for use in the electrical industry. Sales of Rosite in Europe and most of the British Commonwealth are handled by Plessey International, Ltd.

Mr. W. Lewis, chairman of the Midlands Electricity Board, has been elected president of the Birmingham Electric Club for the ensuing year.

At a board meeting held at Hayes on 18th March **Mr. E. T. R. Ball,** A.M.I.E.E., was appointed managing director of the British Electric Transformer Co., Ltd., and his appointment became effective from that date. Mr. Ball joined Crompton Parkinson, Ltd., at Chelmsford in 1928 as senior transformer designer. When, in 1933, the Transformer Department at Chelmsford ceased operation and the transformer production of Crompton Parkinson, Ltd., was concentrated in the B.E.T. Works, Mr. Ball moved to Hayes to become an assistant designer. After a period of special duties he became assistant general manager in 1945 and in 1947 general manager of the Hayes Works. He was appointed a director of the British Electric Transformer Co. in 1954.

Mr. E. T. R. Ball

Mr. J. R. Cox, M.I.E.E., has joined the board of the London Electric Wire Co. & Smiths, Ltd., as technical director. He remains a director of the Liverpool Electric Cable Co., Ltd., but is succeeded as chief engineer and manager of the factory at Bootle by **Mr. A. H. H. Young,** B.Sc., A.M.I.E.E.

Mr. C. Baseden, Associate I.E.E., has been appointed manager of the British Industry Pavilion at the Brussels Universal and International Exhibition, which opens on 17th April. The Pavilion is organised by British Overseas Fairs, Ltd., on behalf of the Federation of British Industries. Mr. Baseden was export trade executive with Siemens Bros. & Co., Ltd., from 1952 to 1957, and had previously been manager of the Outside Construction Department and cable sales manager with the same company. His earlier appointments were with the Western Electric Co., Chicago, Standard Electrica S.A., Santander, Spain, and with Pirelli-General Cable Works, Ltd.

Mr. R. Winsby, manager of the Belfast branch of Philips Electrical, Ltd., recently completed twenty-five years' service with the company, and he and Mrs. Winsby were entertained at a luncheon by the branch staff at a Belfast hotel when a presentation was made. At an official ceremony in London three days later, Mr. G. Hofman, managing director, presented the company's gift of a cheque and a gold watch, and presided at a luncheon attended by other executives.

Mr. H. Fuller has been appointed assistant service manager of E. K. Cole, Ltd. Commencing his career in the radio industry in 1926 with the Sterling Telephone Co., Mr. Fuller joined the Ekco Service Department in 1938, after several years on the sales and service side of the retail business.

Mr. J. N. Toothill, general manager of the Scottish group of Ferranti, Ltd., left by air on 19th March for India. During his three weeks' visit he will meet Government officials and Indian Air Force officers. Ferranti's Edinburgh establishment is responsible for the development of radar and fire control equipment now used in many Air Forces throughout the world.

Sir Hamish MacLaren, Director of Electrical Engineering to the Admiralty, speaking at the annual dinner and dance of the **I.E.E. Western Centre** at Porthcawl on 14th March, said that since the end of the war electrical engineers had devoted a tremendous effort to keep the technological side of our defence services up to date. He cited several examples from the Royal Navy. Referring to atomic development in naval spheres, Sir Hamish said there was no need to explain to engineers the tremendous amount of effort and design required to propel a ship by atomic means. It would have been beyond the scientific and engineering resources of this country to have devoted effort in that direction and at the same time to make the progress we had in the application of atomic fission to the generation of electrical power.

Mr. R. Presswood, director of education, Cardiff, praised the Institution and its work in various fields. Mr. R. W. Steel (district manager, South Western Electricity Board, Bath), referring to the Institution's training schemes, said they would give them not only professional engineers but the technicians which they so badly needed. He thought the Institution was giving an excellent lead to the rest of the country. Mr. D. G. Dodds, industrial relations adviser to the Electricity Council, also praised the Institution's training schemes for young engineers.

Over 250 members and guests were at the dinner. The chairman of the Centre, Mr. J. F. Wright, presided.

At the dinner-dance of the I.E.E. Western Centre at Porthcawl. Left to right: Mr. R. E. Presswood, Mr. J. F. Wright (Centre chairman), Sir Hamish MacLaren (vice-president, I.E.E.), and Mr. D. J. Dodds (industrial relations adviser to the Electricity Council)

Mr. N. R. D. Gurney, A.C.G.I., M.I.E.E., has been appointed sales manager of the Plant Department of the Metropolitan-Vickers Electrical Co., Ltd. Formerly chief engineer, Electrical General Engineering Department, he succeeds **Mr. R. J. Cochran,** who is seconded to special duties.

Mr. N. R. D. Gurney

Mr. Gurney received his technical education at the City and Guilds Engineering College of the Imperial College of Science and Technology, and joined the Metropolitan-Vickers Electrical Co. as a college apprentice in 1926. After short periods as junior engineer on industrial control and rolling mill equipment, he became liaison engineer for technical interchange with associated companies, and in 1931 he was awarded an I.G.E. Fellowship to study steelworks electrical engineering at the General Electric works at Schenectady. In the following year he returned to the Plant Department as rolling mill engineer. He is a member of the Iron and Steel Institute. During the war Mr. Gurney was seconded to special duties. In 1940 he became engineer-in-charge (and later acted as assistant superintendent) of the M-V Gun Carriage Department; in 1943 he was attached

to an Admiralty delegation at Washington, and he later took charge of a contract for special testing plant in connection with naval anti-aircraft fire-control equipment, returning at the end of the war to the rolling mill engineering section of the Plant Department. In 1951 he was appointed chief engineer, electrical general engineering, covering the industrial (including marine), mining and rolling mill sections.

The Electricity Council has appointed **Mr. E. Landucci** to the post of establishments officer. For the past eight years he has been assistant director of establishments of the Central (formerly British) Electricity Authority. After training with a firm of solicitors, Mr. Landucci served for five years in the Town Clerk's Department, Wolverhampton, and, in 1926, joined the staff of the West Midlands Joint Electricity Authority, in whose service he remained for over twenty years and of which he became deputy clerk. On the reorganisation of the electricity supply industry in 1948 he became secretary of the South East Scotland Division of the B.E.A. and joined the headquarters staff in the following year.

Mr. J. R. Allan has been appointed joint managing director of Acme Ventilating, Ltd. He is already a director of Acme Conveyors, Ltd., and is also general manager of the Acme group of companies. **Mr. P. Lowe** is appointed sales director of Acme Ventilating, Ltd., in addition to his present post of sales director of Acme Conveyors, Ltd.

The **Midlands Radio Industry Golfing Society** held its first meeting of the year at Harborne, near Birmingham, recently. The winner of the founders' cup was Mr. E. R. Hill and the runner-up was Mr. L. Cooke.

The directors of Ashley Accessories, Ltd., recently entertained **Mr. and Mrs. J. C. Foxcroft** to a luncheon, to mark Mr. Foxcroft's retirement. Mr. Foxcroft, who was works director, has been with the company for thirty-two years, during which time he has served on various B.E.A.M.A. and B.S.I. Committees, in the accessories field. Mr. D. White (chairman) expressed appreciation of Mr. Foxcroft's services, and Mrs. D. A. White, on behalf of the board, presented a television set to Mr. and Mrs. Foxcroft. **Mr. F. P. S. Deaman,** works manager, will assume responsibility for the company's production.

Presentation to Mr. and Mrs. J. C. Foxcroft. Left to right: Mr. D. White, Mrs. D. A. White and Mr. and Mrs. Foxcroft

Mr. H. Copping, M.I.E.E., managing director of E.C.C. Canada, Ltd., arrived in England on 20th March for consultations with his principals, the Electric Construction Co., Ltd., and George Ellison, Ltd. Mr. Copping, who at one time was manager of the Leeds branch office of George Ellison, Ltd., is chairman of the Toronto Oversea Advisory Committee of the Institution of Electrical Engineers. The Canadian company moved recently to new premises at 66, Colville Road, Toronto, 15. It is responsible for the consultation, sales and distribution services in Canada for E.C.C. rotating machines, rectifiers and transformers, and Ellison high and medium voltage switchgear, motor control gear and hydraulic valves, and "Tufnol."

Mr. H. Copping

Mr. F. Baillie has been appointed works manager of the Scottish plant of IBM United Kingdom, Ltd. He joined the company in 1955, becoming technical manager in 1957.

The annual dinner of the **Royal Commercial Travellers' Schools** was held at the Trocadero Restaurant, London, on 21st March, with the president of the 112th maintenance appeal, Lt.-Col. Sir James Horlick, Bt., presiding. The toast of the Schools was proposed by the principal guest, Lord Coleraine, who said that independent schools should have an assured place in the country's education system. At the Royal Commercial Travellers' Schools the love and security which the children received were of particular importance. In his reply, Mr. Cyril Harvey, chairman of the Board of Management, referred to the "tyranny of too early specialisation" induced by the General Certificate of Education, and to the need for a more widespread knowledge of science.

During the evening the secretary announced that £46,023 19s 10d had been raised by the 112th maintenance appeal and contributions received during the evening, including one for £250 from Mr. Leslie Gamage, brought the total up to £47,224. The Electrical Trades Commercial Travellers' Association gave £673, and it was announced that Mr. S. Johnson, who was formerly with the General Electric Co., Ltd., had raised over £9,000 for the Schools during the 25 years he had been charity steward of the E.T.C.T.A.

The **G.E.C. Witton Apprentices' Association** held its annual dinner on 8th March when more than 300 past and present apprentices attended. Mr. W. J. Bird, who is the first Witton apprentice to be appointed to the board of the General Electric Co., Ltd., proposed the toast to the Association, to which Mr. T. Mitchell, chairman of the Association, replied.

Mr. W. J. Bird presenting the apprentices' cup to Mr. R. S. Hoyle. Mr. T. Mitchell, chairman of the Association, is in the centre

The guest of honour was Professor P. B. Moon, head of the Physics Department at Birmingham University, who replied to the toast to the guests, proposed by Mr. A. Gordon, vice-chairman of the Association. Prizes to the outstanding apprentices were presented by Mr. Bird and the evening closed with a show written and produced by the apprentices themselves. The winning apprentices were:—Messrs. R. Hoyle (apprentices' cup); B. Evans (best all-round sportsman's cup); J. Cable (best student apprentice); P. J. Cron (best drawing office apprentice); G. B. Sparkes (best trade apprentice).

Mr. A. S. Churchill retired on his sixty-fifth birthday on 28th February from Submarine Cables, Ltd. (owned jointly by Siemens Edison Swan, Ltd., and the Telegraph Construction & Maintenance Co., Ltd.), after fifty-one years' service. He was staff foreman of the core serving department in the

Mr. F. S. H. Lemon, managing director, Submarine Cables, Ltd. (left), making a presentation to Mr. A. S. Churchill

submarine cable factory at the Telcon Works, Greenwich. A presentation of a toilet case and cheque was made to him recently by Mr. F. S. H. Lemon, managing director of the company, on behalf of his colleagues.

Mr. E. M. Randall has been appointed advertising manager of Belling & Lee, Ltd. He was previously with the Benjamin Electric, Ltd., and G. Street & Co., Ltd.

At a meeting of the Radio and Electronic Component Manufacturers' Federation on 19th March **Mr. K. G. Smith** (N.S.F., Ltd.) was elected chairman in succession to **Mr. R. Arbib. Mr. H. V. Slade** (Garrard Engineering & Manufacturing Co., Ltd.) was elected vice-chairman.

Mr. A. A. Peters has joined Electro-Mechanical Supplies, Ltd., Coventry, as sales manager. He was previously manager of Rich & Pattison, Ltd.

Mr. A. A. Peters

The London Group of the **Royal Engineers Association** will hold its reunion on 3rd May (6.30 for 7 p.m.) at the Finsbury Town Hall, Rosebery Avenue, London, E.C.1. Applications for tickets (4s each) should be made to the hon. secretary, Room 31, Horse Guards, Whitehall, S.W.1, or to the headquarters of the Association.

Mr. E. A. Lever, B.Sc., B.Com., has resigned from the position of sales director of Ultra Electric, Ltd., which he has held for the past nine years.

The annual general meeting of the **Birmingham Electrical Golfing Society** was held recently. Mr. J. Walker (president) said that he looked forward to new members being enrolled and application forms could be obtained from Mr. F. C. Mealing, 204-206, Newhall Street, Birmingham, 3. The officers and committee for 1958-59 are as follows: President, Mr. W. Horrocks; captain, Mr. T. C. Browne; general committee, Messrs. P. M. King and C. A. Sothers; hon. secretary and treasurer, Mr. F. C. Mealing.

The London area meeting of the **Electrical Industries National Golf Championship** will be held on 10th July at Denham Golf Club, Bucks. Golf cards may be obtained from Mr. L. H. Welch, London Electricity Board, 46, New Broad Street, E.C.2.

Mr. J. H. Johns, station superintendent, Cambridge generating station, retires from the Eastern Division, C.E.G.B., on 31st March after having completed fifty years' service in the industry. Mr. Johns began with the Urban Electric Supply Co. at Dartmouth in 1908. In 1913 he was transferred to the Isle of Wight Electric Light & Power Co., becoming station superintendent of the Newport station in 1919 and superintendent of the Cowes station in 1927. He went to Cambridge in 1945.

Mr. J. H. Johns

The Council and Executive Committee of the City and Guilds of London Institute have conferred the Insignia Award in Technology on **Mr. C. W. Brown,** A.M.I.E.E., who retired from the General Post Office in 1949, after forty-five years' service, with the rank of staff engineer. In post-war years Mr. Brown was concerned with problems of national semi-automatic trunk working, and the preparation of schemes for alternative systems of direct operator dialling between selected European cities. He represented the Post Office on the C.C.I.F. of the International Telecommunications Union. He was instrumental in the preparation of the Institute's earlier syllabuses in telecommunications subjects.

The Council has conferred the Fellowship of the Institute (F.C.G.I.) upon the following past students:—**Mr. W. A. Coates,** M.I.E.E., formerly general sales manager and a director of the Metropolitan-Vickers Electrical Co., Ltd., who retired in 1956; **Mr. G. H. Hopewell,** A.C.G.I., A.M.I.C.E., M.I.Mech.E., F.Inst.F., M.I.Mar.E., managing director, Foster Wheeler, Ltd.; and **Mr. F. C. Wright,** A.C.G.I., managing director of Standard Telephones & Cables, Ltd.

The annual dinner of the Apprentice Association of **South Wales Switchgear, Ltd.,** was held recently at the Royal Hotel, Cardiff, some 250 apprentices attending. The principal speakers were Mr. A. J. Nicholas (managing director), Mr. D. Prosser (former editor of the *Western Mail*) and Mr. H. Finch, M.P. Following the dinner the assembly was entertained by apprentices with musical items.

OBITUARY

Mr. Clifford Palmer Banham, assistant to Mr. Lilley, manager of the Lighting Department of A.E.I. Lamp & Lighting Co., Ltd., died suddenly at his home at 124, Whiteleaf Hill, Whiteleaf, Surrey, on 17th March, after a short illness. He was fifty-nine.

Mr. Banham was born and educated in South Africa and during the 1914-18 war, although under age, served with the Coldstream Guards in France and was wounded in action. He joined the British Thomson-Houston Co. as an apprentice at Rugby in 1919. Following the 1929 merger he was appointed chief lighting sales engineer with the Edison Swan Electric Co., Ltd., and was subsequently appointed manager of the lighting section in 1947, joining the A.E.I. Lamp & Lighting Co. on its formation in 1956. He was a past vice-president of the Electrical Trades' Commercial Travellers' Association.

Mr. G. Perrins, A.M.I.E.E., who until his recent retirement was a director and chief engineer of Bullers, Ltd., died on 7th March at the age of sixty-seven. Mr. Perrins joined the company in 1912 and held the position of chief engineer for many years. He was appointed a member of the board in 1953.

Mr. C. K. Bird.—The death occurred on 16th March, in his sixty-sixth year, of Mr. Colin Kidman Bird, B.A., who until he relinquished the position for health reasons at the end of March, 1956, was manager of turbine contracts of the British Thomson-Houston Co., Ltd., at Rugby. From that date he was consultant to the manager of turbine contracts. Mr. Bird was educated at Tettenhall College, Wolverhampton, and King's College, Cambridge. From 1914 to 1918 he served in H.M. Forces, joining the B.T.H. Co. as a student apprentice in 1919. He became a member of the Contracts Department in 1922, handling turbine business, and was appointed assistant manager of turbine contracts in 1943. He succeeded Mr. H. G. Rowe as manager in 1945.

The late Mr. C. K. Bird

Mr. James C. A. Cowan, A.H.W.C., A.M.I.E.E., works manager of the Clyde Iron Works, Tollcross, Glasgow, of Colvilles, Ltd., died on 18th March at the age of 76.

Mr. James Rollo Walker, A.M.I.E.E., who was in the service of the London County Council for forty-one years, died on 15th March at Bexhill-on-Sea.

Batti-Wallahs' Ladies' Night

THE annual ladies' night of the Batti-Wallahs' Society is now firmly established as one of the most popular electrical social functions of the season and there were about 350 members and guests with their ladies at last Friday's function held at the Connaught Rooms, London; they were received by Dr. L. G. Brazier (president), Mr. W. M. Couch (immediate past-president) and Mrs. Couch.

The speeches were in keeping with the occasion—brief and witty. Mr. Couch, in proposing the toast to the president, spoke of his distinguished career in the electrical industry, culminating in his present position of director of research and education with British Insulated Callender's Cables, Ltd., and referred to him as an eminent electrical engineer who had made a lasting mark in the electrical profession.

In responding, Dr. Brazier compared some of the earlier functions with last Friday's event. He humorously recalled that in the early minutes of the Society it was recorded that members voted against the presence of ladies fearing that they would deter members from attending. Now they had to limit the tickets and the event was among the top functions in the electrical calendar. He paid tribute to the work of Mr. T. C. F. Bigland (the "Mate") in organising such a successful function.

Mr. K. Druce proposed the toast to the ladies in a speech both witty and gallant, and Mrs. McFadzean made a charming response on behalf of the ladies.

Dancing followed the dinner and the choice of Shirley Abicair, the well-known singer, who gave a number of songs during the evening, proved a popular one.

1. Mr. and Mrs. W. N. C. Clinch being received by Dr. L. G. Brazier (president), and Mr. and Mrs. W. M. Couch. 2. Mrs. Moffat, Sir John and Lady Hacking, Mr. and Mrs. J. R. Beard and Mr. D. Moffat. 3. Mr. and Mrs. J. Temple Hazell, daughter and friend. 4. Messrs. H. V. Pugh, A. C. Thirtle and W. S. Steel with their ladies. 5. Mr. T. C. F. Bigland's table. 6. Sir Harold and Lady Bishop. 7. Mr. K. Druce proposing the toast "Sweethearts and Wives." 8. Mr. and Mrs. W. H. MacFadzean

INDUSTRY AND THE HOUSE

Capital for the Nationalised Boards

By A. M. F. PALMER, A.M.I.E.E., M.Inst.F., M.P.

A SMALL Bill which may be a prelude to other things was agreed to recently by the House of Commons with little outside notice taken. I refer to the Nationalised Industries Loans Bill.

As the Financial Secretary to the Treasury, Mr. J. E. S. Simon, said in introducing the bill on second reading, it does no more than advance the time within which the powers for the financing of nationalised industries given by the Finance Act, 1956, may be exercised. It will be remembered that in 1956 the Government decided, in the interests of general administrative tidiness, that in future when nationalised boards required new capital, instead of going to the market the Treasury itself should advance the money. This was not such a vast change because previously when stock issues had been made the amount required was always substantial and it was common practice for the Treasury to support the issues. Through the new procedure the financing operations have become smoother and the need for the boards to have interim recourse to the banks has been reduced. The existing two year period of operation will run out on 31st March; the new Bill, when law, will extend it to 31st August. But the Bill does not extend the limit of money to be borrowed; this remains at £700 million.

Financing Methods to be Reviewed

Mr. Simon hinted that when the Budget came along the whole future of financing methods for nationalised industries would be reconsidered in what he called "the context of the general review of the Government's economic policy." Mr. Simon wisely went on to say that he did not propose to be drawn into any discussion at present on right or wrong methods of financing nationalised industries. However, he confessed he had re-read the two-year-old Commons debate, which took place in the early hours of the morning (I think about 4.0 a.m.), some time in 1956. On that occasion the Tory "Fuel Furies" demanded that nationalised industries be driven on to the market without benefit of Treasury guarantee. Their argument was that in this way they would be made more economical in the use of capital and administratively more efficient.

Mr. Gordon Walker, for the Opposition, now said that the Labour Party was apprehensive about the attitude of the Government towards the financing of nationalised industries. They could not accept the view of the Herbert Committee that there was an automatic and natural identity between the judgment of the money market and the national interest. He called this a "metaphysical proposition." If publicly owned industries were compelled to borrow money from the City without Treasury support that would bring an "unpredictable hazard" into Government planning.

The leading nocturnal performers of two years ago, Mr. Nabarro and Lord Hinchingbrooke, intervened, riding their pet hobbyhorse once more. But while Lord Hinchingbrooke was prepared to ride this steed again the whole length of the course, not so Mr. Nabarro. For when pressed closely the latter accepted that the Coal Board and the railways could not hope to raise sufficient money for essential development through the money market; he had to agree also that atomic energy was not a trading undertaking; he was prepared in addition to leave the power stations to be paid for in the conventional fashion. Indeed it seemed his only real candidates for "financial discipline" were the Area Electricity and Gas Boards. Even then it was evident he would prefer that electricity should be disciplined first.

Others in the debate thought it was a little difficult to know what exact advantages would be gained from Mr. Nabarro's demands if applied. If it made any change at all the result would probably be to put up costs which could only be passed on to the consumer. Lord Hinchingbrooke was, nevertheless, pained at what he regarded as his old colleague's weakening. He accused Mr. Nabarro of "qualifying his position." Ultimately, a stern policy had to be devised, he said, which would send "all the nationalised industries to the market at the same time." As a mere engineer who is no financier, I can only suspect that this would be quite a hectic day—long to be remembered—in the life of the City of London!

To sum up the position as I see it: nationalised industries are mostly statutory undertakings; they are obliged to do a vast number of things by the law of the land which no normal business could be expected to accept; electricity supply, for instance, cannot pick and choose its markets and is always under pressure to keep its prices as low as possible. Hence, to give nationalised boards public responsibilities, and at the same time to deny them public support, in the long run is likely to mean that we have the worst of both worlds out of their working.

Sooner or later members of Parliament—and the political parties—must finally make up their minds on their attitude to basic industries now in public hands. For myself, I think we must reject the fiction that public boards are "commercial undertakings." Even though they are independently administered, and distinct up to a point from the civil service, public boards in practice operate public services. This means they must build up a tradition, an outlook and an administrative practice reproducing all that is best *in their own field*. This I am sure is what the man in the street wants from nationalisation; especially in a country where the bulk of industry is likely to remain for a long time in private ownership subject to its own different principles.

Purchase Tax and the Budget

Some important parliamentary days are now ahead in connection with the Budget and the Finance Bill. With the recession in trade which has developed it seems essential that the Government should be made to lift some of the burden of the excessive and often discriminatory purchase tax imposed on electrical appliances. With the surplus of small coal nobody can seriously claim that to-day to use electricity for domestic purposes is to expend scarce fuel resources wastefully. The trouble, unfortunately, about the Finance Bill is all too often that its drafting makes it difficult for members to propose tax reductions on particular items and at the same time keep within the rules of order.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Off-Peak Heating

WE are finding it difficult to obtain the average consumption of electric floor heating compared with other systems, presumably because the industry has not had much experience of the cost of floor heating in direct comparison with other methods of electric central heating.

The impression we have is that the average consumption of electricity per annum of electric floor heating is something of the order of 1,500 kWh per kilowatt of installed load. If this is so it does not compare very favourably with a properly designed low-temperature heating system by means of fluid-filled radiators placed under windows and under time switch and thermostatic control. Our records lead us to believe that the average consumption for an electric radiator system is around 1,000 kWh per kilowatt installed.

I was recently in the U.S.A. and in Scandinavia where in discussions with some of the leading authorities on heating I failed to find any expert who was prepared to recommend floor heating in preference to low-temperature systems by radiators or baseboard heaters. The chief argument used against the floor heating system, which I was assured had been fully tested in the countries concerned, was its lack of flexibility and the problem of counteracting the downward movement of cold air from windows.

One fully appreciates the commercial reason for developing off-peak loads, but as storage space heating is likely to be used for only, say, four or five months out of twelve, it is surely desirable to consider most fully the advantages and disadvantages. In years to come we may have water storage generating systems or special cheap small coal power stations designed especially for dealing with peak loads. Perhaps other loads such as electric water heating using storage water heaters may turn out to be more suitable for "filling in the valleys" all the year round.

It is desirable for true comparisons to be made between forms of electric heating. A simple test would be to compare a block of flats with electric floor heating, with an adjoining block of flats with electric central heating. We on our part would be very happy to lend the radiators free of charge for any such experiment. In any case the capital costs per kilowatt of installed load are roughly the same, in spite of purchase tax.

Such a test is surely necessary because the customer must be considered. He may prefer to use less electricity and have a more flexible system.

There are many other ways of "filling in the valleys," for example, ripple control of space and water heating, special tariffs for time switch controlled space heating systems and so on. One very obvious market is that of shops. Some Area Boards provide maximum demand tariffs for shops, the maximum demand being created by the lighting load. The use of low-temperature electric heating which can be switched off before the lighting peak has advantages which are frequently overlooked. Heating engineers will put in a complete heating scheme using methods of heating other than electricity when they might use a heating system designed partially for the use of some other fuel and partially to make use of the off-peak period for electricity.

The way to get at the truth is first to obtain the maximum amount of information from other countries which have tried floor heating in comparison with other forms of heating and for this information to be published.

Secondly, let us persuade some local authority to build one block of flats using one form of electric heating and another block in the same locality with an alternative method. Let us go a stage further and persuade a local authority on one of its housing schemes to build, say, a couple of dozen houses or bungalows using electric floor heating and persuade the same local authority to build a similar number of cottages or bungalows using another method of electric central heating.

Let us have some direct comparisons so that the public can be given the most factual information possible.

London, W.1. A. C. HAZEL.

[This letter has been abbreviated.—Editors, *Electrical Review*.]

B.S.I. and Moulded Lampholders

THOSE of your correspondents who have found fault with the dimensional requirements for moulded lampholders specified in the current (1952) edition of B.S. 52 may like to know that the technical committee concerned, so far from being unaware of the criticism, are actively engaged in reviewing the specification with the object of improving the quality and performance of moulded lampholders made in accordance with it.

Among other changes, it is probable that a limit will be set to the permitted temperature rise in the moulded lampholder, which by itself should go far to remedy the troubles experienced in the past in fitting or removing the shade carrier ring.

London, W.1.

J. F. STANLEY,
Divisional Chief Technical Officer,
British Standards Institution.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton	£197 0s 0d
COPPER, H.C. Electro	ton	£177 15s 0d
Fire Refined 99·70%	ton	£176 0s 0d
Fire Refined 99·50%	ton	£175 0s 0d
COPPER Tubes	lb	1s 8¾d
Sheet	ton	£205 5s 0d
H.C. wire and strip	ton	£223 15s 0d
LEAD, English	ton	£75 10s 0d
Foreign	ton	£74 0s 0d
MERCURY	flask	£77 0s 0d
TIN, block (English)	ton	£730 5s 0d
ZINC, G.O.B. Foreign	ton	£63 15s 0d
Electrolytic	ton	—
BRASS Tubes (solid drawn)	lb	1s 5d
Sheet	ton	—
Wire	lb	2s 3¾d
PHOSPHOR BRONZE Wire	lb	3s 5¾d
PLATINUM	oz	£26 15s 0d
RUBBER, No. 1 R.S.S. spot	lb	22¼d—22½d

ELECTRICAL ENGINEERS' EXHIBITION

Opening by Mr. F. J. Erroll

IT was a sign of recognition of the importance of the Electrical Engineers' Exhibition at Earls Court (25th to 29th March) that so many of the leading people of the electrical industry were present at the opening ceremony last Tuesday. Mr. G. H. Parker, chairman of the Association of Supervising Electrical Engineers, presided and introduced Mr. F. J. Erroll, Parliamentary Secretary of the Board of Trade, who was deputising for Sir David Eccles, President of the Board of Trade. Mr. Parker claimed that the display was the largest electrical exhibition ever seen in this country. Representatives of countries all over the world were attending and every visitor was a potential customer for the wide variety of equipment which was shown.

Mr. Erroll congratulated the promoters of the Exhibition upon its remarkable growth from 80,000 sq ft in 1953 to the 450,000 sq ft of the present show. Last year about 65,000 trade buyers had visited the Exhibition. Mr. Erroll mentioned the electrical industry's tremendous export achievements and said that from Faraday's time this country's electrical industry had led the world. He made special reference to the hospital service exhibit which demonstrated the importance of electricity in health matters.

Sir Harold Bishop, president of the A.S.E.E., thanked Mr. Erroll, who was himself an electrical engineer, for opening the Exhibition. Sir Harold then presented the two awards made by the Exhibition promoters for the best exhibits. In the industrial section the award went to the Clare Instrument Co. for its testing equipment for small transformers; Sangamo Weston, Ltd. (ice-warning system) and Bertram Thomas, Ltd. (six-panel, metal-enclosed 440 V switchboard) were highly commended. The award in the domestic section was made to the General Electric Co., Ltd., for its "Supreme" cooker; Santon, Ltd. ("Oxford" water heater) and Berry's Electric, Ltd. ("Chameleon" inset fire) were highly commended.

At a subsequent luncheon, Mr. J. Flood, chairman, Electrical Engineers (A.S.E.E.) Exhibition, Ltd., presided and proposed the toast "The Exhibitors and the Success of the Exhibition." He welcomed Mr. Erroll and representatives of a number of overseas countries. He congratulated the winners of the awards and in this connection thanked the Electrical Association for Women for their assistance, mentioning that the E.A.W. president, Viscountess Kilmuir, was among the guests.

Sir George Nelson responded to the toast, saying that he was a manufacturer—not merely a maker of things but one who encouraged research and development upon which the great electrical industry was based. He thanked the Association for giving manufacturers the opportunity of showing the world what they were doing. He reviewed the history of the Exhibition from its small start as a

At the opening ceremony: (Left) Mr. F. J. Erroll; (centre) Mr. G. H. Parker, Mr. Erroll, Sir Harold Bishop, Mr. J. Flood and Mr. P. A. Thorogood; (right) Mr. E. A. Bromfield and Mr. Thorogood

means of improving the knowledge of the Association's members of what was available. Its rapid expansion had necessitated the formation of a guaranteed company to run it and the manufacturers had rallied to its support.

Sir George emphasised the importance of export trade upon which our standard of living depended. We had to import half our food and most of our raw materials and we could only pay for them by exporting. Although the credit squeeze had been necessary he asked the Government to help exporters by enabling them to give competitive credit terms.

On behalf of the exhibitors he thanked those responsible for the Exhibition, particularly mentioning Mr. P. A. Thorogood, Mr. E. A. Bromfield and Mr. R. F. Mathieson.

Details of the exhibits of the Lancashire Dynamo Group (with the exception of Lancashire Dynamo Nevelin, Ltd.) were unfortunately omitted from our stand-by-stand preview of the Exhibition last week.

Two new developments are being shown on Stand D.5 by Lancashire Dynamo & Crypto, Ltd. The first of these is a small forced ventilated torque motor having an output of approximately 50 lb/in from 0 to 900 r.p.m. for use as a continuous spring for reeling and similar drives. These motors can run at any speed or remain stalled continuously and both large and small sizes are available. Secondly, in addition to the company's standard range of 4, 6 and 8in non-flameproof brakes, a fully flameproof Buxton certified motor and flameproof 6in brake are exhibited. Among other exhibits are a telegraph power plant motor generator; a standard single operator welding generator available in 200, 300 and 400 A sizes; and a special display of f.h.p. motors. A new design of geared unit, with triple reduction gears, is shown for the first time.

Foster Transformers, Ltd., exhibit items from their range of testing equipment, including a 2·5 kW flash test set and the standard "Foster" oil test set. The company also shows various metalclad and cast resin low voltage transformers and, of special interest, a 1,500 kVA distribution transformer showing winding and core construction.

On the same stand Crypton Equipment, Ltd., show battery charging equipment together with examples of a new range of specially designed vehicle battery chargers. Exhibits also include a weatherproof portable engine starter for use in railway applications; a voltage controlled electric organ supply rectifier using germanium diodes; and a.c./d.c. laboratory supply equipment.

On page 540 reference was made to a new range of "C" type ventilated motors, displayed for the first time at the Electrical Engineers' Exhibition by Brook Motors, Ltd. (Stand N.13). These motors, which are manufactured in a range of sizes from ½ to 50 h.p., were said to be made in conformity with B.S. CW(ELE)6246; actually the standard is B.S. 2960.

Science Teachers and National Service

IN an adjournment debate in the House of Commons, Mr. William Stones asked the Government to reconsider the liability to call-up of scientific teachers in technical colleges. Mr. Edward Short asked if the principle of giving deferment to graduates could not be extended to all science graduates in all schools and colleges, and Dr. Horace King said that if the Minister did this he would be providing technical colleges with a much-needed group of technical teachers who might be lost to education if they had to go into National Service.

Replying, Mr. Robert Carr, Parliamentary Secretary, Ministry of Education, said that first-class graduates in science, mathematics or engineering or graduates with second-class honours in the same subjects who had subsequently taken a higher degree, such as Ph.D., were deferred for teaching posts. Thus, these people were available to technical colleges, on a par with other forms of employment. It was true, however, that the field for deferment for a teacher in a secondary school was wider than if he took a post in a technical college. It was a deliberate policy decision to give the secondary schools more favoured treatment; any failure in the recruitment of mathematics and science teachers to the schools must be felt, in the end, in the technical colleges because it was on the schools that the colleges must rely for the supply of students with an adequate grounding in mathematics and science. If that foundation was not laid, the Government's plan for a major expansion in scientific and technological education would be placed in jeopardy.

The second reason for the differential was that the Government thought it desirable that a teacher taking up a teaching apppointment in a technical college should have had some experience of industry, although it was not absolutely essential. If they gave further deferment concessions solely to technical colleges it would undoubtedly reduce the proportion of their staff who would have had some industrial experience. The Government believed, therefore, that any extension to benefit the technical colleges ought also to be given to the jobs requiring similar qualifications in industry. This was recognised by the Willis Jackson Committee. The Committee assessed that the technical colleges needed—for an increase of 7,000 teachers between 1956 and 1961—an average annual increase of about 1,400. In 1956 there was a net increase of about 900. In 1957 it was well over 1,000. In 1958 the indications were that the increase would not be far short of 1,400.

B.E.A.M.A. IN 1957-58

ANNUAL REPORT OF THE COUNCIL

REVIEWING the year's work in its report for 1957-58, the Council of the British Electrical and Allied Manufacturers' Association says that the situation of the electrical industry was dominated by world economic conditions and the effects of the Government's economic and financial policy. Although manufacturers have been assisted by the continued fall in the prices of raw materials the ultimate result may be fewer orders from countries producing those materials.

After a reference to possible repercussions on British industry of events on the North American continent, the Council expresses uncertainty about the effects of the Government's restrictive measures on research, development and technical education upon which the future prosperity of the industry depends.

Figures of employment in the electrical industry show a reversal of the 1956 trend; the total of 727,700 employed in December last was 23,500 more than in December, 1956, indicating the recuperative efforts exerted by the industry.

A tribute is paid to Lord Citrine for his work in the electricity supply industry since 1948 and mention is made of the Central Electricity Generating Board's ambitious programme of new construction. Points brought out are that by 1965 17 per cent of the country's electrical energy requirements will be produced by nuclear power stations; that the production of electricity by means of nuclear fusion has definitely appeared on the horizon; that the C.E.G.B. hopes to have a 550 MW steam turbo-alternator in commission by 1963; and that the unit capital cost of generating plant has been held practically constant since 1948.

Adequate Wiring

A matter of great importance is the securing of adequate domestic and commercial wiring installations. It is recognised that a campaign is required to bring this before the public, architects, builders and engineers, and the manufacturers of installation equipment have been examining the factors involved and are seeking the support of the professional bodies interested in the subject.

In a brief mention of the Monopolies Commission's report on the supply and export of electrical and allied machinery and plant the Council says that the report did not appear to take a long-sighted view of the problems and needs of a heavy capital goods industry.

Representations have recently been made by the domestic appliances sections of the Association to the Financial Secretary to the Treasury with a view to securing a revision of the purchase tax schedules which bear unfairly on domestic electrical equipment. In a criticism of the Restrictive Trade Practices Act the Council compares it unfavourably with legislation operating in other countries. Moreover, it points out that the Act was passed at a time when boom conditions prevailed and circumstances are now vastly different.

It is noted that the power of the Central Electricity Generating Board to manufacture plant was restricted in the Electricity Act, 1957, to plant for research or development or the repair or maintenance of equipment. Generating plant installed in England, Wales and South Scotland in 1957 fell short of the 2,000 MW mark by only 17 MW. Generating plant exported amounted to well over 900 MW.

The C.E.A. Co-ordinating Committee held eight meetings in 1957, and useful work has been done by the Electricity Boards/B.E.A.M.A. Joint Committee. Subjects covered included switchgear standardisation, meter dial standardisation and cookers.

Railway Electrification

Further substantial orders have been placed for the railway electrification programme. Progressive plans have been made by the industry to meet the heavy demand for equipment during the next fifteen years, at the rate of £20 million a year. The closest co-operation will be necessary to integrate the production work with the substantial business in overseas traction which has been developed by the industry. In order to accommodate the demands of the British Railways Plan the rate of output will have to be almost doubled in 1958.

Participation in exhibitions has been the principal matter discussed by the Nuclear Energy Trade Associations' Conference. N.E.T.A.C. did not consider as practicable a Board of Trade suggestion that a liaison and information office should be set up on the Continent to deal with inquiries for nuclear power equipment and to watch developments in connection with Euratom. The firms concerned consider that their existing contacts with Continental buyers are satisfactory.

A series of meetings was held during the year to enable member-firms in the London, Birmingham and Manchester areas to exchange views on the Government's proposals for British participation in a European Free Trade Area. At each meeting Mr. J. O. Knowles, chairman of the Council, presided, and Mr. D. Maxwell Buist, export director, gave an address; reports were also given on the plans for the electrical and allied industry section at the Brussels Exhibition.

Contacts of representatives of domestic appliance manufacturers with Continental manufacturers are briefly referred to. (In this issue we report a recent meeting in Paris.) Whitworth and Unified screw threads are touched upon. (B.E.A.M.A.'s views on this subject were set out in our issue of 14th March, page 490.)

Discussions are proceeding with various interested bodies on the subject of a National Testing Authority. It is hoped to create an efficient and speedy system which will operate at the minimum cost and avoid any interference with production and marketing. It seems probable that the Authority will initially deal with domestic appliances and possibly certain catering equipment.

Among other matters touched upon in the first part of the report are the National Council for Electrical Installation Contracting, future trade fairs in the United Kingdom (inquiries showed that members favoured specialised fairs and biennial exhibitions), the Electrical Engineers' Exhibition, the Engineering, Marine, Welding and Nuclear Energy Exhibition, the Instruments, Electronics and Automation Exhibition, public relations services, the B.E.A.M.A. Catalogue and the *BEAMA Journal*.

Conditions for international contracts produced by a

Working Party of the Economic Commission for Europe were approved by the Council. The opinion is expressed that the International Civil Engineering Conditions recently published by the International Federation of Consulting Engineers and the International Federation of Building Works Contractors are inappropriate for electrical and mechanical engineering contracts. It is hoped that the E.C.E. Working Party on International Arbitration will be able to find an arbitration procedure satisfactory to both sides. Mention is made of the work of the International Commission on Rules for the Approval of Electrical Equipment (C.E.E.) and the International Electrotechnical Commission (I.E.C.).

Purchasers continue to depend on the B.E.A.M.A. contract price adjustment clause for long-term contracts for electrical equipment as a practical means of determining a fair adjustment between the parties to a contract for unpredictable variations in costs. So far any decline in the cost of materials has been more than offset by increases in labour costs.

Two-thirds of the cost of the Electrical Power Collection at the Science Museum, South Kensington, opened last year, was borne by the electrical industry.

During the year the Heat Control Devices Committee, in collaboration with the Domestic Electric Cooker Section, completed the drafting of a proposed standard for domestic cooker thermostats (a.c.) and rotary switches for domestic electric cookers (a.c.). The Committee has also assisted the Commercial Electric Catering Apparatus Section with the preparation of a draft standard specification for electrically-heated catering equipment generally.

In 1956 the Association of Short-Circuit Testing Authorities raised the upper limit of voltage and output rating to which it would test the apparatus of manufacturers outside the Association. As a result the number of certificates issued to non-members in 1957 was double that in the preceding year. Rules were issued during the year to ensure uniformity of testing of air-blast circuit-breakers at all A.S.T.A. stations.

Overseas Trade

The Overseas Trade section of the report states that the total value of exports of electrical and allied equipment in 1957 was £279·2 million of which 54·3 per cent went to the Commonwealth, 9·7 per cent to the six Rome Treaty countries, 8·8 per cent to the other ten O.E.E.C. countries, and 27·2 per cent to other countries. The figures show how deeply the electrical industry is concerned with the proposed European Free Trade Area. The estimated total of world electrical exports in 1957 was £1,200 million of which this country supplied 23·2 per cent, the United States 29·6 per cent, Western Germany 21·2 per cent and all other countries 26 per cent.

A table shows that while this country's share of the trade has fallen from 28·1 per cent in 1952 to 23·2 per cent in 1957 that of Western Germany has risen from 11·5 to 21·2 per cent. The Council calls attention to the handicaps under which British exporters operate, including high taxation, purchase tax and restrictive legislation at home and many difficulties in overseas markets.

Stressing the great importance to British electrical manufacturers of export trade, the Council says that they have to quote for every job large or small while their competitors are able to pick and choose which contracts they will tender for and adapt their prices for each particular case. It is stated that tens of thousands of tenders are put in every year by British exporters. These bear the brunt of the world-wide struggle while, regrettably, an unduly large proportion of British electrical manufacturers do not export at all and therefore contribute nothing to this vital part of the nation's economy.

The competition of the United States was felt mainly in Canada, Latin America, the Middle East and, to a smaller extent, in India and Pakistan. Among Continental competitors Western Germany is by far the most formidable. East Germany and Czechoslovakia competed mainly in heavy gear, whereas Hungary's activities were confined principally to small diesel generating sets, lamps and meters. Russia's activities were mainly with China and the Eastern European countries. Competition from Switzerland and Sweden has resulted in increased exports from these countries, particularly to China, Finland and Eastern European countries. Belgium has also been successful, especially in the field of transformers.

The report reviews the activities of the Export Panel and the Domestic Electrical Appliances Section Export Committee, as well as the Overseas Committees. In referring to tariff inquiries in some of the Dominions the Council emphasises the importance of opposing applications for duties when they affect electrical equipment. It is feared that the import restrictions imposed by New Zealand will have a serious effect upon British exporters, particularly suppliers of domestic appliances.

Member countries of the General Agreement on Tariffs and Trade (G.A.T.T.) have considered an application for membership from Switzerland and have decided that Germany has now no reason for retaining the remainder of her import restrictions. France, too, is being pressed to restore a proportion of her liberalisation methods. The Rome Treaty and its effects on outside countries has also been studied. In a reference to anti-dumping duties, the Council mentions the importation of switchgear into South Africa. It says that local manufacturers are not at present making switchgear in the highest rating capacities and it seems that the South African authorities are interpreting very liberally the G.A.T.T. provision referring to the retardation of an industry not yet established. Mention is made of the United Kingdom Customs Duties (Dumping and Subsidies) Act, 1957, which, it is said, has not yet been applied to any electrical goods.

The Council welcomes the partial lifting of the embargo on trade with China and says that the " two-way traffic " of business men between Britain and China has been resumed. It suggests that the embargo list affecting trade with China and the Eastern Bloc should be further pruned.

On the subject of finance for export the Council makes reference to the activities of the Export Credits Guarantee Department and the Committee on the Working of the Monetary System. Brief mention is also made of a number of other matters affecting export trade such as the Advisory Council on Middle East Trade, the Economic Commission for Asia and the Far East and the Advisory Council on Overseas Construction. Visits of representatives from Finland, Uruguay and Canada are noted and it is reported that the work of the B.S.I./C.S.A. Approvals Agency has recently increased, auguring well for the future of electrical trade with Canada. Much attention is given to the proposed European Free Trade Area. B.E.A.M.A. Sections are setting up committees to make an intensive study of the future situation for their own products.

Full particulars are given of the exhibits at the Brussels Exhibition of the electrical and allied industries, reference being made to the British Electrical Conference on 16th and 17th May and to the British National Days (10th to 12th July).

The remainder of the report is devoted to reviews of the activities of the Council Committees and the work of the Sections and Technical Committees.

The B.E.A.M.A. Catalogue

Mr. J. O. Knowles, chairman of the B.E.A.M.A. Council, presents a copy of the 4th edition of the B.E.A.M.A. Catalogue to Mr. J. K. Vaughan-Morgan, Minister of State, Board of Trade. Col. B. H. Leeson, director of the B.E.A.M.A., is on the left and Mr. D. Maxwell Buist, the export director, on the right

OVER 15,000 copies of the fourth edition of the B.E.A.M.A. Catalogue, published last week, have been sent to trade commissioners and representatives, overseas buyers, public utility officials, distributors and users in every country in the world. This edition of 962 pages has been produced earlier than usual so that copies will be available for distribution at the Brussels Exhibition which opens next month. It is published for the British Electrical and Allied Manufacturers' Association by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, price £6.

As in previous years the descriptive catalogue pages have been designed throughout to a standard format and each of the three divisions is printed in a distinctive second colour. These divisions cover Electrical Power Plant; Electrical Equipment in Industry, Transport and Communications; and Domestic and Commercial Electrical Appliances, Lighting, Accessories and Installation Material. In addition to the complete catalogue separate volumes each consisting of the contents of one of the divisions and the complete Trade Directory have been produced for use at Brussels.

The Trade Directory gives the principal addresses of all B.E.A.M.A. member-firms, their subsidiary or branch offices, etc., in the United Kingdom and over 4,780 names and addresses, grouped territorially, of overseas branches, representatives and agents. The Classified Buyers' Guide contains over 1,300 headings and there is a glossary of technical terms in English, French, German, Portuguese and Spanish.

At a Press conference in London last week to launch the new edition, Mr. J. K. Vaughan-Morgan, Minister of State, Board of Trade, said the British electrical industry's exports had doubled during the past ten years. The industry was also one of the largest indirect exporters. He congratulated the B.E.A.M.A. on having produced such a valuable and attractive form of publicity as the catalogue.

Mr. J. O. Knowles, chairman of the B.E.A.M.A. Council, mentioned that the catalogue dealt for the first time with nuclear engineering. Last year out of a total production of £1,300 million the industry had exported goods worth £279·2 million which was 2½ per cent more than the record figure for 1956. Employment had been built up to 727,700, after the fall in 1956 attributed to purchase tax and hire-purchase restrictions, but he doubted whether the present position could be held.

Export markets were always in their minds. They knew that their profit margins were falling at home and abroad. Mr. Knowles said that as existing types of products became less profitable " we seek by redesign, by technological improvement, and by technical and market research to find new sales. We have not been unsuccessful."

Cause of a Turbine Breakdown

AT a meeting of the Institution of Mechanical Engineers on 21st March, Messrs. A. L. G. Lindley (General Electric Co., Ltd.) and F. H. S. Brown (Central Electricity Generating Board) described the step-by-step investigations made into the failure of a 60 MW steam turbo-generator at Uskmouth power station.

The 3,000 r.p.m. turbine was a conventional two-casing machine with double-flow low-pressure rotor. The accident occurred in January, 1956, less than eight weeks after commissioning, and resulted in eleven casualties (two fatal) in addition to total destruction of the low-pressure cylinder and the hydrogen-cooled generator. The remaining components were severely damaged, but fire was restricted to some burning of generator insulation. Four other sets on full load continued in operation.

A few seconds before the break-up the switch controlling the motor driving the exciter was accidentally tripped, but no notable amount of steam escaped into the station to indicate gross overspeeding consequent on rejection of load and the emergency and governor valves were found to be closed.

No damage other than that attributable to the accident and no fault in design or construction of governors and duplicated emergency protective gears were revealed by exhaustive examination, which produced clear evidence, however, that the speed (which should have been controlled at 7 per cent above normal) must have reached at least 5,000 r.p.m. within 13 sec if the steam valves remained substantially open during that time.

This narrowed the investigations to finding the reason for the delay in their closure which was ultimately traced to the building up of black iron oxide (magnetite) on working surfaces of pistons and cylinder bores of the oil system associated with the governor and emergency gear, which caused temporary seizure. The formation of black iron oxide of very small particle size was found to be due to slight contamination of the oil by brackish water coupled with abnormally long shut-down periods.

Pulse Amplitude Modulation*

1.—PRINCIPLES OF EFFICIENCY AND RECIPROCITY

By K. W. CATTERMOLE, B.Sc.

AMONG the electronic techniques newly applied to telephone switching is multiplex transmission of many conversations on a common highway in the form of amplitude-modulated pulse trains. The problems are not the same as in communication circuits generally, since within the exchange the signal is not degraded by a long, noisy and band-limited path; the primary need is to provide adequate transmission with exceptionally simple and reliable apparatus. Conventional pulse modulators and demodulators have two features which offset much of the economy normally gained by multiplex working; they have a large loss, and work in one direction only. Thus one conversation requires two paths, each with a high gain.

The modulation methods described here avoid these drawbacks, and convey signal power through the entire path with low loss. A continuous signal is converted into a modulated pulse train of substantially the same mean power, and the pulse train is similarly converted back to continuous signal. Each process requires energy storage in reactance network, so the essential parts of the system are as shown in Fig. 1. The transmitter storage network is charged by a smooth flow of power from the signal source, and when briefly connected to the highway by closure of the electronic switch S it discharges impulsively. The receiver storage network is charged impulsively from the highway, and then, while isolated for a relatively long time, discharges slowly to provide a smooth flow of power into the load. If the switches S be closed periodically for a fraction 1/A of the interval between successive closures, then a continuous signal of unit power applied to the transmitter produces a pulsed signal of peak power A in the highway and a continuous signal of unit power (save for small losses) in the receiver load R. The experimental work used 2-microsec pulses at 100-microsec intervals, the factor A thus being 50.

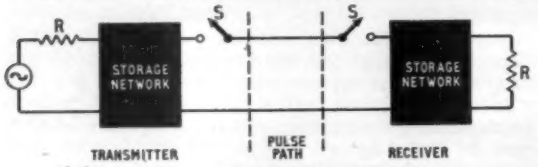


Fig. 1.—Storage p.a.m. system

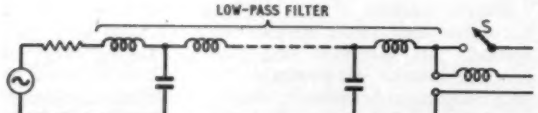


Fig. 2.—Storage network

The storage network usually takes the form shown in Fig. 2. The delay line provides on discharge the required pulse width, and also constitutes the terminal capacitance of a low pass filter whose cut-off frequency is not more than half the sampling frequency (so, in the present example, not more than 5 kc/s). The optimum networks are the same for modulator and demodulator: the one device which can perform either function is called a "modem." The whole transmission path is symmetrical and therefore reciprocal. The essential action on closure of the switch is an exchange of charges between the two stores. Since the change of current in the filter inductors during the pulse is negligibly small, the process may be understood by considering two delay lines or networks which, having been charged to different potentials, are then connected momentarily. As an example, suppose one to be initially discharged, and the other charged to a potential E (Fig. 3). When the switch is closed, each line faces a matching termination, and the terminal p.d. jumps to E/2. The step of potential travels along each line, is reflected at the far end, and returns in the same sense to the common end. If the switch opens at this instant, the potential of the initially empty store jumps to E while the other falls to zero; the charge has been transferred. If both stores are charged initially, the pulsed connection causes them to exchange charges.

The filters smooth out these rapid transitions and ensure that the source and load experience only smooth flow of power, which at the pulsed end of the stores is observed as a gradual charge or discharge during the long intervals. The voltage waveforms on the pulse path and the adjacent ends of the stores are shown in Fig. 4.

Transmission

The overall transmission of the systems may be calculated in terms of a pulse-sequence impedance function which is a measure of the storage network's response to a modulated pulse train. Let the pulses at intervals t, be modulated by a sinusoid of frequency ω and applied to a

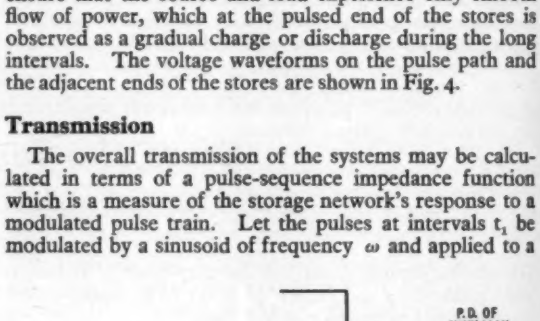


Fig. 3.—Interchange of charges between delay lines

* Summary by the author of Part I of an I.E.E. Radio and Telecommunication Section Paper "Efficiency and Reciprocity in Pulse Amplitude Modulation," presented on 19th March. Part II, which follows, deals with testing and applications. The authors are both with Standard Telecommunication Laboratories, Ltd.

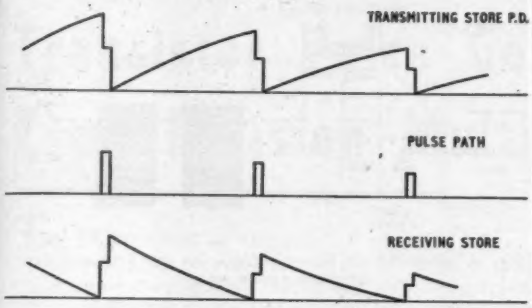


Fig. 4.—Charge, discharge and transfer waveforms

network whose response to a single impulse is A(t). Then samples of the resulting signal taken immediately after each pulse fall on an envelope which is the product of the original modulation envelope and the pulse-sequence function

$$G(j\omega) = \sum_{n=0}^{\infty} \epsilon^{-j\omega nt_1} A(nt_1)$$

Similar functions have been used in the analysis of servo systems with intermittent data. Given also the steady-state transfer impedance of the store $H(j\omega)$ and the line capacitance C, the overall transmission (insertion voltage ratio) is

$$T(j\omega) = \frac{2CR}{t_1} \cdot \frac{[H(j\omega)/R]^2}{2\,CG(j\omega) - 1}$$

Transmission through more complicated channels containing repeaters, cables or intermediate storage can be derived in similar terms. Each expression is the product of three factors: a filter transfer function, a constant defining the mean level, and a periodic function depending on the network's pulse-sequence impedance.

The fundamental bounds of the transmission function are the widest conceivable: it is possible in principle to obtain lossless transmission over a bandwidth of half the sampling frequency. To appreciate this simply, suppose the filters to have a sharp cut-off at half the sampling frequency. Then the impulse response is

$$A(t) = \frac{1}{C} \cdot \frac{\sin \pi t/t_1}{\pi t/t_1}$$

passing through zero at $t = nt_1$ ($n = 1, 2, 3 \ldots$); each pulse is transmitted independently, without any reaction from its forerunners, and there is simple transfer of accumulated charge from the transmitting to the receiving end. This limiting bandwidth and attenuation are not realisable but may be approximated; well-known types of filter, namely maximally-flat and equal-ripple, have provided useful though probably not optimum performance, many practical results being given in the companion paper.

2.—TESTING AND APPLICATIONS

By J. C. PRICE, B.Sc.

OBJECTIVE measurements have been carried out on a variety of storage networks. The filters were designed for use with one end open-circuited and to be maximally flat with a cut-off frequency of half the repetition rate of 10 kc/s. The terminating capacitance consisted of that of the delay line or tuned circuit. For the tests described a pair of 12-element filters were constructed to approximate closely to optimum conditions. A pair of four-element filters were constructed as approximating to what was anticipated to be a practical compromise between performance and cost of components. Other more simple filters were also tested. The capacitors were close-tolerance silvered-mica types. The inductors were constructed using ferrite cores with a mica-shaped gap. Typical Q-factors were of the order of 50 or 60. It was found that small variations in filter characteristics do not critically affect pulse transmissions. In later experiments, therefore, equal-ripple (Chebyshev) filters of small deviations have been used in preference to maximally-flat filters. For a given bandwidth and number of elements these have a sharper cut-off rate which is useful in eliminating the unwanted components between 5 and 10 kc/s. This feature is especially valuable in the voice-frequency dialling arrangement considered later.

For transmission measurements, modems were connected using a diode bridge with three-point contact diodes in each of the arms. The speed of operation was chosen to be in accordance with practical requirements for good telephone quality with perhaps 25 channels. Thus, the diode bridge was operated at a repetition rate of 10 kc/s by pulses of two microsec duration. Fig. 1 shows the frequency response of systems with high impedance terminations. Curve (a) shows the case of transmissions with the capacitance of the storage device as the only element. Curves (b) to (e) indicate the effect of increasing the number of filter elements. These show the predicted approximations to level response improving with more elaborate filters. Curve (f) shows the case where the delay line of previous experiments has been replaced by a tuned circuit and, it will be noted, a slightly lower loss results.

A source and load impedance of about 25 kilohms is normally required. To provide this with 600 ohm audio terminations necessitates the use of transformers.

Oscilloscope waveforms are given in Figs. 2 and 3. Fig. 2 shows the time-division multiplex output waveform for a whole system. Fig. 3 shows typical traces on a delay line store for sine wave modulations.

To decide how much degradation due to band limitations, generation of spurious frequencies and other effects, was tolerable in conjunction with normal telephone apparatus, and thereby to settle on a simple but adequate

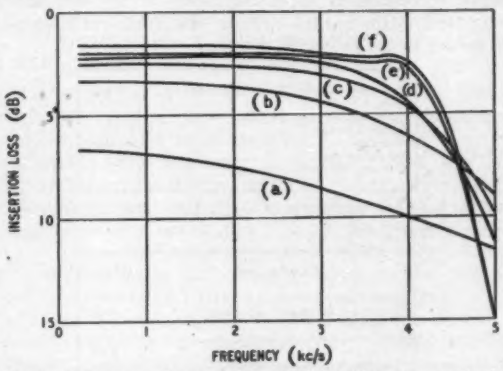


Fig. 1.—Frequency response of system (high impedance terminations)
(a) One-element, (b) two-element, (c) three-element, (d) four-element and (e) twelve-element filter and delay line; (f) twelve-element filter and tuned circuit

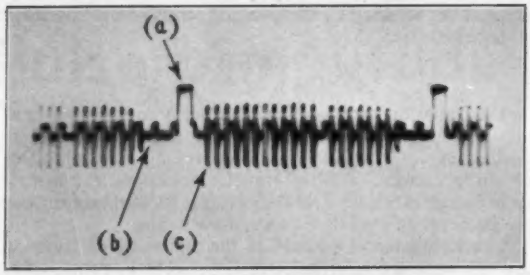


Fig. 2.—Time-division multiplex output waveform
(a) 6 microsec 10 kc/s synchronising pulse. (b) 2 microsec 125 kc/s fine synchronising pulse. (c) Modulated 2 microsec audio pulse

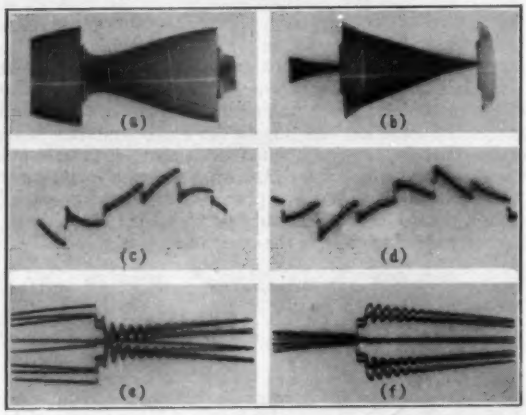


Fig. 3.—Typical traces on a delay line store for sine wave modulations
(a) Voltage-modulation envelope on transmitting modem. (b) Voltage-modulation envelope on receiving modem. (c) Voltage waveform on transmitting modem. (d) Voltage waveform on receiving modem. (e) Discharge of transmitting modem into line. (f) Charge of receiving modem from line

modem, subjective speech tests were carried out. Two telephone subscribers' sets were connected by alternative paths providing seven types of transmissions. Thirty persons chosen to include both sexes and as much variety of age and occupations as available were asked in turn to converse with an interviewer over the telephone link. The seven conditions were selected at random by the interviewer, the other party having no clue to the type of transmission being used. Subjects were asked to award marks according to their judgments of the systems as compared with normal public telephone intelligibility according to the following rating.

Opinion of Intelligibility	Mark
Considerably above average	5
Above average	4
Average	3
Below average	2
Considerably below average	1

The average estimate of each type was as follows in order of merit.

Connection	Mark
Direct connection	4·18
12-element filter and delay line	4·15
12-element filter and tuned circuit	4·03
4-element filter and tuned circuit	3·92
4-element filter and delay line	3·48
No filter with tuned circuit	3·02
No filter and delay line	2·80

It would appear that a discerning ear clearly detects

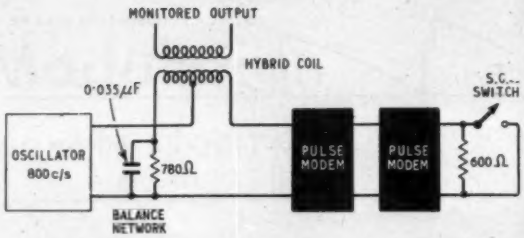


Fig. 4.—Basic circuit for voice-frequency signalling with two synchronous pulse modems

the improvement in reproduction when the response is not restricted to 5 kc/s. However, multiplex systems using four-element and 12-element filters are quite acceptable as giving good intelligibility as distinct from fidelity. People who habitually used the telephone rated the multiplex systems with filters nearly as highly as the direct connection. Those less used to the telephone tended to be more distracted by the imperfections of the less good systems. A four-element filter seems a good provisional choice judging by speech transmission alone. There is a case for a slightly better filter which would be appreciated by some people. A filter of considerably more elements is unnecessarily extravagant with components.

Voice-Frequency Signalling

The fact that the modem system is both low loss and reciprocal implies that it is "transparent" and that impedance changes can be "seen" through it. If the low-frequency termination of a pulse modem differs appreciably from the matching impedance then some of the signal current is reflected back into the modem. Because of the reciprocity it is translated into pulses and conveyed through the normal route back to the signal source, and the input impedance of the remote modem, as faced by the signal source, is modified as a result of the mismatch on the output. The application of reflections to voice-frequency signalling is illustrated by the experimental circuit shown in Fig. 4. Two synchronous pulse modems were connected together, one having a matched load, with provision for short circuiting, the other being fed with v.f. tone through a hybrid transformer, with a balancing network on the conjugate arm chosen so as to annul the output from the balancing winding. When the short-circuit was applied to the remote modem a substantial output was obtained from the balanced winding. The ratio of peak amplitudes in the two conditions exceed 20 with a five-element 10 per cent ripple filter.

For telephone dialling a satisfactory method is to cause a mismatch at the exchange by use of a saturable transformer there in the audio path. Since the transformer must not approach saturation on normal line currents, to avoid distorting speech, it is best to make the line current drawn during a dial pulse substantially larger. Alternatively, normal line current can be counterbalanced by current in another winding on the transformer.

Although the method of efficient and reciprocal pulse amplitude modulations can be used with other switching devices, semi-conductors appear the most suitable. They combine moderately high speed, very small forward potential difference when conducting, and reverse leakage when non-conducting which is adequate for most purposes. Measured values of crosstalk margin were in the range 46 to 66 dB for commercial point-contact diodes and 55 to over 70 dB with junction transistors or improved laboratory diodes.

Transistor Pulse Generators for Time-Division Multiplex*

By K. W. CATTERMOLE, B.Sc.

TRANSMISSION or switching of telephone channels by time-division methods requires the provision of many pulse trains at reasonably precise relative time positions. The main functions are:—(i) Generation of simple periodic pulse trains; (ii) frequency of division of pulse trains; (iii) interlacing of many trains with permanent time positions; and (iv) interlacing of many trains with assignable time positions. The paper describes transistor circuits for all these functions. Most of the experimental work was carried out with the timing required for 25-channel telephony with a sampling rate of 10 kc/s.

The point-contact transistor, having current gain without phase change, can be built into a regenerative circuit by the addition of a simple feedback element such as an impedance in the base lead or an admittance between emitter and collector. A delay line or network in the feedback path accurately defines the duration of a pulse generator (Fig. 1a). Consider the circuit to be quiescent, with the emitter slightly negative, the collector at a large negative potential, and the line charged to their potential difference. Current through R_1 causes the emitter potential to rise: when it becomes positive to base, collector current is turned on, which tends to discharge the line and drive the emitter further positive. The action is regenerative and continues until the collector potential has risen almost to zero: it produces the leading edge of the pulse shown in Fig. 1 (c) and launches a step down the line. Equilibrium is maintained for twice the line's delay time, then the reflected voltage step returns and drives the emitter negative. The transistor is cut off, the collector potential falls and the line is left with a negative charge. Current from the positive supply slowly recharges the line until the initial condition is regained.

* Author's summary of I.E.E. Radio and Telecommunication Section Paper presented on 19th March.

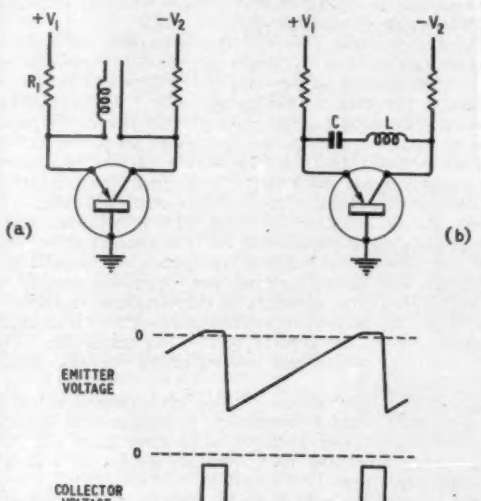


Fig. 1.—Pulse generator (a) delay line timing (b) LC timing (c) waveforms

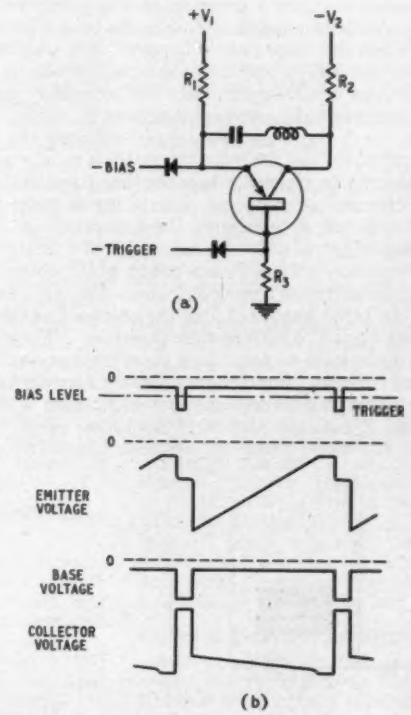


Fig. 2.—Pulse generator with base resistance (a) circuit (b) waveforms

The circuit of Fig. 1 (b), in which the feedback path is a tuned circuit, acts in a somewhat similar way, producing a pulse of length about $\pi\sqrt{LC}$. Both circuits have much better definition of pulse width than can be obtained by feedback through a capacitor only.

Insertion of a resistance in the base lead (Fig. 2a) increases the regeneration, permits a negative output pulse to be drawn, and facilitates triggering. With bias and trigger applied to the emitter (Fig. 2b) the immediate shift of emitter potential on firing disconnects the trigger source and so permits the use of short trigger pulses; alternatively, negative trigger pulses may be fed to the base.

The slow recharging of the feedback path imposes a recovery time during which the circuit cannot operate. Frequency division by a small factor n is obtained by applying the primary pulse train to a trigger circuit whose recovery time falls between $(n-1)$ and n periods; having fired on the first pulse of the train the transistor is biased

off until after the $(n-1)$th pulse, but is free to respond to the nth.

Stable division by large factors requires that the pulse interval, as well as the pulse duration, should be determined accurately by passive networks: a factor of 20 to 30 in one stage is readily achieved using two feedback networks, one for each purpose. The additional network for pulse spacing is conveniently placed in the base lead (Fig. 3a). It consists of a short-circuited delay line which, driven by a negative output pulse from the transistor, returns a negative pulse to the base at multiples of four times the delay time (Fig. 3b). The transistor is biased so that it fires only on conjunction of one of these pulses with an input trigger pulse: not necessarily the first conjunction, since the recovery time may be chosen to fall between the $(r-1)$th and the rth, so reducing the delay time required to $\frac{1}{r}$ of the pulse interval (r is usually 2 or 3).

In transmission systems, where the time position allotted to each channel is permanent, interlacing of pulse trains may be achieved by arranging the generators in a ring, each being triggered only on conjunction of a timing pulse from a common source with a gating pulse obtained by delaying the output of a preceding stage (Fig. 4). Switching, on the other hand, requires the arbitrary assignment of various signals to various time positions. The divider circuit can be used to generate a pulse train at an assignable time position. For n channels with sampling interval nt_0, the primary train has an interval t_0: then a divider by n has n possible phases of operation (Fig. 5). It requires the pulse from an external source to define

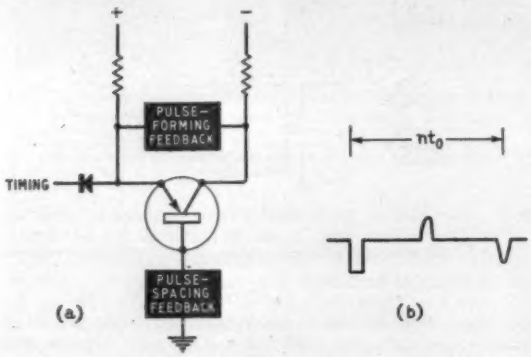


Fig. 3.—Frequency divider (a) schematic (b) gating waveform on base

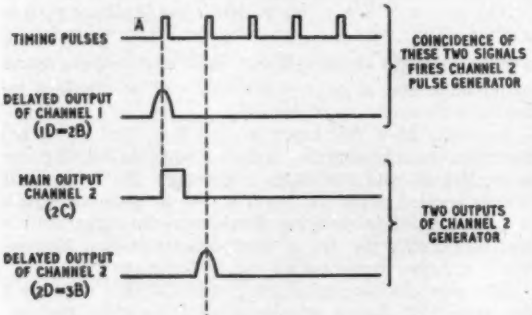

TIMING PULSES
A
COINCIDENCE OF THESE TWO SIGNALS FIRES CHANNEL 2 PULSE GENERATOR
DELAYED OUTPUT OF CHANNEL 1 (1D=2B)
MAIN OUTPUT CHANNEL 2 (2C)
TWO OUTPUTS OF CHANNEL 2 GENERATOR
DELAYED OUTPUT OF CHANNEL 2 (2D=3B)
MAIN OUTPUT CHANNEL 3 (3C)

Fig. 4.—Pulse sequence control

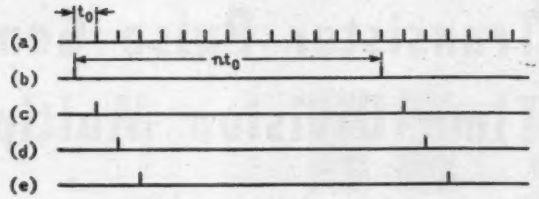


Fig. 5.—Interlacing of pulse trains

the allotted position, which it then retains until it is deliberately cleared.

A generator with a range of assignable time positions, together with a pulse modem as described in the companion papers, forms a time-division selector switch which is a good analogue of a normal rotary switch in that (i) it provides a low-loss two-way connection; (ii) it is self-holding, retaining the position to which it has been set; (iii) it corresponds to a complete selector, not (like a simple electronic switch) just a pair of contacts.

Discussion

The discussion was opened by Mr. T. H. Flowers, who said the transmission dealing with pulse modems appeared to have been invented more or less simultaneously by Haard and Svala in Sweden, one of the present authors, and French of the Post Office. He agreed that its chief use was likely to be on electronic exchanges with trunk exchange switching and on the primary power supply to other applications. The paper on design was the most complete and satisfactory treatment so far of this particular equipment. The evidence on testing was not entirely convincing. It was too early to assess the relative values of this method of switching and transmission and alternative methods; only time would tell. Within the next year or two a decision would have to be made between relative methods.

Mr. L. I. Farren held that electronic switching techniques were very suspect to transmission engineers, but the concept of the authors was completely new and the tests were convincing. Nevertheless, a number of questions remained unanswered. For instance, how many 25-channel units could be connected together without substantial degradation in transmission performance ?

Mr. G. H. Parke observed that a number of engineers on t.v. resistors had been allowing speech power to heat up a resistance for 99 per cent of the time and only transferring 1 per cent of the power when they could have avoided it by adopting the principles set out in the papers. He had been surprised to see the references to "buzz" and "mush." Other systems with which he was familiar did not suffer in this way, but it was clear from what Mr. Cattermole had said that these imperfections did exist.

Mr. R. B. Herman held that it was still not certain whether the diode switch was likely eventually to be better than the symmetrical junction transistor. At the time when the work was done none of the latter was nearly fast enough. However, advances in the frequency response of transistors had been considerable, more so than with diodes, on which substantial reverse voltage was important. Their use in linear circuits had received more attention than in switching circuits.

Mr. E. H. Cook-Yarborough said his organisation had 300 to 400 point-contact transistors in continuous operation day and night. The youngest were three years old. Had there been substantial improvements since then and what reliability did the authors obtain ?

Mr. Thompson said that he was concerned primarily with the design of reactance networks. Mr. Cattermole had shown elegantly the ideal low-pass filter that was wanted as regards not only transfer characteristics but also the right kind of input impedance. If one went to an expert, however, he would not design the ideal low-pass filter network discussed by the authors. Mr. Thompson described ideal networks which might be worth considering.

INDUSTRIAL NEWS

"Co-operation" Committee's First Meeting

The Committee on Co-operation between Electricity and Gas Boards, the constitution of which was reported in our issue of 14th March (p. 483), held its first meeting on 20th March under the chairmanship of Sir Cecil Weir. The Committee decided to invite organisations and people interested in this field to put in evidence which should be sent to the Secretary of the Committee at the Ministry of Power, 10, House South, Millbank, London, S.W.1. The Committee says it would be most helpful if evidence could reach it as soon as possible but in any case by 23rd May.

The Committee is "to consider ways in which, by co-operation between the Area and Scottish Electricity and Gas Boards in the performance of their respective statutory functions, the administration of the services of a like kind provided to the public by the two industries might be improved, and to make recommendations." It has been made clear that the Committee is not concerned with the general policy of the electricity and gas industries or with competition between them.

More Cases for Trade Court

A third list of agreements to which the Registrar of Restrictive Trading Agreements has been directed to give priority in reference to the Restrictive Practices Court was issued last week by the Board of Trade. Some 250 agreements are involved under 22 headings, but only one, "Electric Lighting Equipment and Fittings," concerns the electrical industry. The agreements under this heading cover the fixing of minimum prices and hire charges; maintenance of resale prices subject to standard discounts; and standard terms and conditions of sale. From these agreements the Registrar will select those that appear to him as the most typical, and Notices of Reference, which mark the formal commencement of proceedings, will then be issued as soon as possible. A relevant factor is how far the issues in cases relating to different agreements in the same industry are likely to be the same. Where they are, the Registrar points out, commencement of a second case relating to that industry before the Court has decided upon the first one would be likely to involve waste of time and money.

Twenty-two of the agreements covered by the Board of Trade's two previous directions have now been abandoned. These include recommending prices and discounts for copper wire rods; fixing prices and terms and conditions of sale for certain types of electric resistance furnaces; and fixing prices and discount rates to various classes of customer, and terms and conditions of sales for subsidiary power instruments.

Among the 43 cases that are now proceeding are those on agreements covering domestic electric cookers, fractional h.p. motors, transformers, valves and cathode-ray tubes, and bare copper products for electrical purposes. In 28 of the 93 cases respondents have been granted an extension of time for stating their cases, and in 11 a further extension has been granted by the Court. Statements have been filed in 14 cases and are expected shortly in 17 more. The Registrar's answer has been given in three cases. Here again an extension beyond the six weeks provided for in the rules has been generally required. The stage of fixing a date for a hearing before the Court has not been reached in any case. (An article describing the process by which a case reaches the Court appeared in the *Electrical Review*, 20th December, 1957.)

Nuclear Health and Safety Officer for C.E.G.B.

This issue contains an advertisement by the Central Electricity Generating Board for a Chief Nuclear Health and Safety Officer. Applicants are required to have been trained as physicists, physical chemists or in medicine, and must have experience of industrial management, including control of "hazard in operations which involve potential dangers." The salary offered is in the range £4,000 to £5,000 per annum.

It is stated that the C.E.G.B. is planning to build up a small team of scientists and doctors who will be charged with the responsibilities of seeing that the health and safety organisation in the nuclear power stations is adequate, of giving these organisations functional guidance, and of seeing that operating manuals are prepared and followed.

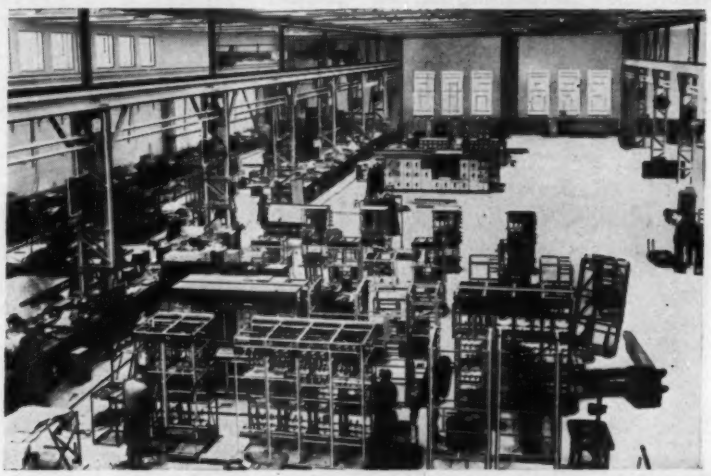
Electrical Machinery Trades Convention

The annual convention of the Association of Electrical Machinery Trades will be held from 26th to 29th April at the Queen's Hotel, Eastbourne. Delegates will assemble on Saturday, 26th April, when there will be an informal dinner and dance. Sunday will be a "free" day, and on Monday morning the Council meeting will be held. A number of manufacturers are co-operating in an exhibition of modern insulation materials, varnishes and winding wires, to be held in the afternoon. In the evening there will be a dinner and dance. On the final day Mr. A. T. Stretton, British Thomson-Houston Co., Ltd., will present a paper on "The Mechanical Design of Electric Motors" and, following luncheon, members will disperse. In addition to their ladies, members may also take their children if they so wish.

Whipp & Bourne Extension

An extension to their Castleton factory has recently been opened by Whipp & Bourne, Ltd. The extension provides an additional area of some 25,000 sq ft and it is solely for the erection of a.c. and d.c. switchboards. It has overhead cranes and there is a loading bay at the south end. It joins

The new factory extension of Whipp & Bourne, Ltd., at Castleton



the older portion of the works which are primarily used for the manufacture of a.c. and d.c. circuit-breakers.

Equipment for Portuguese Electric Trains

The General Electric Co., Ltd., has received an order for 1,500 V d.c. traction equipments for three new four-coach trains and four additional trailer coaches which are to be built in Portugal for the Estoril Railway. This is the third order placed with the company for the equipment of rolling stock on the 5ft 6in gauge line connecting Lisbon with Estoril and Cascais, and was secured in the face of keen competition from Continental manufacturers. Together with the rolling stock, mixed-traffic locomotive, and equipment for two traction substations supplied since 1950, the total value of contracts undertaken by the G.E.C. in connection with the Estoril Railway now amounts to some £750,000. The new coaches will be built by Sociedades Reunidas de Fabricacoes Metalicas Lda. (SOREFAME), of Amadora, and will be of stainless steel construction. One of the additional trailers will be equipped as a driving trailer.

Each motor coach in the new trains will be powered by four axle-hung motors with a 1-hr rating in weak-field of 170 h.p. The motors will be equipped with roller suspension bearings and will drive through Wiseman resilient gearwheels. Control will be by electro-pneumatic contactors, with automatic acceleration, and provision will be made for arresting the progression at an intermediate weak-field notch when working stopping trains. The normal rate of acceleration for a train with all seats occupied will be 1·12 m.p.h./sec, but it will be possible to select a lower rate when rail conditions make this necessary. Maximum service speed will be 56 m.p.h.

New Brook Motors Films

The Brook production unit (Brook Motors, Ltd.) has completed two new 16 mm black and white sound films.

A "still" from the Brook Motors film "Six Hundred Horses" showing electric motors in a building board mill

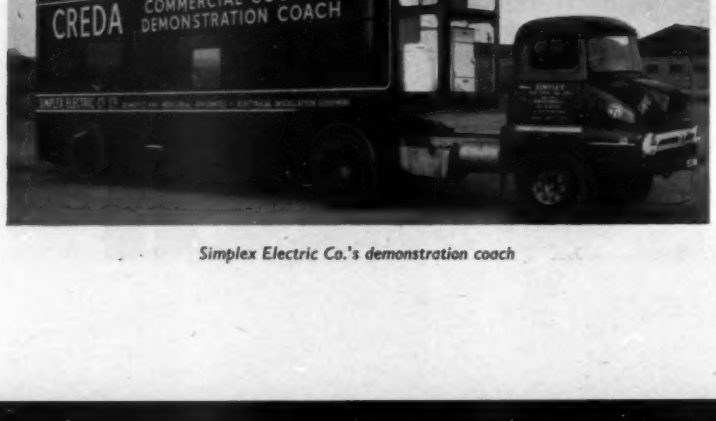
"Six Hundred Horses," lasting for 14 minutes, shows the production of large electric motors seen through the eyes of a visiting customer. The film covers all the manufacturing processes, giving prominence to the winding methods, the application of "cold jointing" for connections, and testing. The other film, "Not By Magic," deals in 16 minutes with a number of varied electric motor applications. The company has produced a loose-leaf catalogue of its films to which fresh sheets may be added as further films become available.

Copies of the films may be obtained from the Films Division, Brook Motors, Ltd., Empress Works, Huddersfield.

Simplex Demonstration Coach

To provide caterers in various parts of the country with an opportunity of inspecting electric cooking apparatus before they make purchases, the Simplex Electric Co., Ltd., has fitted out a demonstration coach in which all items of cooking apparatus are connected ready for demonstration and test.

The coach will be driven by a fully qualified chef, and it is hoped that Electricity Boards and contractors will make full use of the service this coach provides. In addition to cooking apparatus, it includes space heating and water heating appliances. It is being shown for the first time at the Electrical Engineers' Exhibition at Earls Court.



Simplex Electric Co.'s demonstration coach

"Son et Lumiere"

Thorn Electrical Industries, Ltd., and Electric & Musical Industries, Ltd., are to co-operate in providing the technical services for the *Daily Telegraph* "Son et Lumiere" event at Cardiff this year. Following the successful season at Greenwich last year, the *Daily Telegraph* recently announced that a similar spectacle will be produced in the grounds of Cardiff Castle. The season will probably commence in mid-July, when the Empire Games are to be held in Cardiff, and will continue throughout August and September.

Atomic Power Constructions, Ltd.

Progress in the organisation of Atomic Power Constructions, Ltd., is reviewed in the spring number of "The Link," the works magazine of the Richardsons Westgarth group. This consortium was formed in December, 1956, with an authorised share capital of £1,000,000 as a joint company representing Richardsons Westgarth and Crompton Parkinson, Ltd. Subsequently it was joined by Trollope & Colls, Ltd., and Holland & Hannen and Cubitts, Ltd., the civil engineering contractors. A few months ago two further companies participated—Elliott Bros. (London), Ltd., and the Fairey Aviation Co., Ltd.

An organisation has been built up in London and the main research and development programme in connection with the company's design of reactors is carried out in laboratories at Heston, Middlesex, which work in conjunction with the Weapons Division of the Fairey Aviation Co. This work includes investigations into heat transfer problems, compatibility tests, thermal cycling, structural tests,

temperature measurement within the reactor, work on beryllium, zirconium, niobium, stainless steel and ceramic fuel, heat flow from extended surfaces, mass transfer of graphite, and corrosion problems. The company also has at its disposal the Elliott Bros. research and development establishment at Boreham Wood, Herts.

Atomic Power Constructions, Ltd., has entered into an agreement with Babcock & Wilcox, Ltd., by which the latter company will design, manufacture and erect large reactor pressure vessels and supply and operate the Goliath crane required for their site erection.

The company is equipped to engage in the design of nuclear propulsion units for marine and other applications.

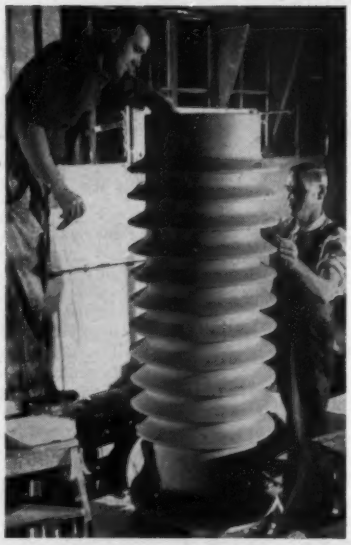
Electronics Sales Agreement

Ericsson Telephones, Ltd., and the Solartron Electronics Group, Ltd., have entered into an agreement whereby the Solartron Group will sell certain products, particularly nucleonic and electronic instruments and components, manufactured by Ericsson Telephones. Details of the arrangement were announced at a Press conference in London last week by Mr. J. H. Reed (managing director, Ericsson Telephones) and Mr. E. E. Jones (commercial director, Solartron Electronics Group). The agreement will have a world-wide scope, excluding Scandinavia and South Africa, and will cover the United Kingdom. Mr. Jones stated that the products of the two companies were complementary and not competitive. There was no question of a merger with Ericsson Telephones, and Solartron hoped to enter into similar agreements with other concerns.

Film about Insulators

The extent to which the traditional skills of the craftsman potter are employed in the manufacture of porcelain insulators will probably come as a revelation to most people seeing the new film "Insulators in the Making." The film, which has been produced for Doulton Industrial Porcelains, Ltd., and runs for thirty minutes, was shown for the first time in London last week to a distinguished audience of electrical engineers.

After surveying the varied applications of porcelain insulators (the company makes some 1,200 different patterns), the film traces the processes of manufacture from the mixing of the raw materials to the final power frequency and impulse tests in the company's high-voltage laboratory. Of special interest are the scenes showing the way in which clay cylinders are formed into the familiar insulator shapes on a "jolley" or specially designed lathe, with moulds and metal profiles taking the place of the potter's hands. The new tunnel kiln, which commenced working in January last year, takes 90 per cent of the Tamworth factory's output and the single firing operation fires body and glaze in a carefully controlled heat cycle lasting 72 hours.



In this shot from "Insulators in the Making" skilled potters are shown carrying out final work on a porcelain insulator prior to firing

Speaking after the film, Mr. M. C. Blythe, sales director, pointed out that routine tests were now carried out not only to British but also to American N.E.M.A. standards. Insulators for Canada had been tested after having been reduced to a temperature of −40 deg F. Work was also proceeding on new materials that would combine the best features of plastics and porcelain; on semi-conducting glazes; and on accelerated life tests during which electrical tests would be carried out at intervals. A 275 kV porcelain bushing had been produced for experimental purposes.

Metropolitan-Vickers Apprentice Hostel

The Metropolitan-Vickers Electrical Co., Ltd., has completed the first stage of its apprentice hostel, "Tyntesfield." The main building consists of a large converted residence which will ultimately be the central feature of the complete plan. The hostel is situated in an attractive part of Sale, Cheshire, and stands back from the main road in extensive grounds.

The lounge of the M-V apprentice hostel at Sale, Cheshire

At present the hostel includes dormitory accommodation, and the rooms are decorated in a pleasing contemporary style with specially designed furniture and fittings. All the rooms are centrally heated and they include a large dining room and a lounge. Since October the hostel has accommodated forty boys, and in allocating the places preference has been given to those who are recruited for the company's professional and technician apprenticeship courses.

Batteries for Dounreay

Three stationary batteries manufactured by Pritchett & Gold and E.P.S. Co., Ltd., have recently been supplied to the United Kingdom Atomic Energy Authority for the new atomic power station at Dounreay, Scotland. Two of these batteries will supply emergency services in the main station and the other is for switchgear operation and indication in the Dounreay switching station. Complex charging and control equipment has also been supplied for the batteries in the main station. Largest of the three is a 240 V 800 Ah battery which, among other duties, powers essential control equipment in the event of a failure in the mains supply. The second battery in the main power station is a 50 V installation of 25 closed-top cells with a capacity of 75 Ah at the 10-hour rate. Charging and distribution equipment has again been supplied by Pritchett & Gold. The duties of this battery include emergency supplies to a variety of indicating, alarm, control, metering and recording instruments. For the switching station the company has supplied, through A. Reyrolle & Co., Ltd., a 110 V battery with a capacity of 150 Ah at the 10-hour rate.

Gregory Award

Crompton Parkinson (Stud Welding), Ltd., announce that a second cash award of $1,500—or $2,000 in scholarships for any individual or school of the winner's choice—will be given for the year's most outstanding contribution in the field of semi-automatic electric arc stud welding.

The principal award will be made to the person responsible for the development of stud welding applications or studs which shall be judged most significant on the basis of:—Reducing costs for industry, or improving the appearance, serviceability and life of a product or structure, or performing a function not possible by any other method. A complete stud welding unit (tool, timer and generator power source) will also be presented to the engineering school or college whose students and faculty shall have submitted the most outstanding group of entries in this competition. Additional equipment awards to educational institutions will be made on the recommendation of the judges if warranted by the calibre and/or number of entries. Residents in all countries where the Nelson stud welding process is in use are eligible for the award. Gregory Industries Inc., Lorain, Ohio, licence associates of Crompton Parkinson (Stud Welding), Ltd., are the sponsors of this competition, and the awards will be presented at a luncheon of the American Society for Metals in Cleveland on 28th October next. Entry forms and rules may be obtained from Crompton Parkinson (Stud Welding), Ltd., 1-3, Brixton Road, London, S.W.9. The closing date for entries is 10th July.

Large Furnace Contract

A contract for electric furnaces valued at approximately £500,000 has been placed with Birlec, Ltd., Birmingham, by the Newport Division of the Steel Company of Wales, Ltd., for the production of special grades of steel for the electrical industry.

Burmese Delegation at Ekco Works

The Burmese Trade Delegation now in the United Kingdom visited the Southend-on-Sea works of E. K. Cole, Ltd., on 14th March. The delegation, which was headed by the Hon. Bo Khin Maung (Burmese Minister of Industries), was accompanied by the Burmese Ambassador in London, U Aung Soe. Escorted by Mr. E. K. Cole, chairman and managing director of E. K. Cole, Ltd., together with other Ekco directors, the party toured the radio, television, plastics and electronics factories.

Motor Manufacture in Brazil

The *Fortnightly Review* of the Bank of London and South America states that according to recent statistics Brazilian production of industrial electric motors is about 300,000 a year. This is additional to motors for domestic equipment, the production of which is about 500,000. The Brazilian electric motor industry has made considerable progress during recent years, and about half of all machinery operating in Brazil is already being driven by locally manufactured motors.

Caroline Haslett Trust Scholarships

The Caroline Haslett Trust recently awarded scholarships to Miss Beryl C. Oliver (Birmingham), Miss Carolle S. Sharp (Piddinghoe, Sussex), Miss Mary Mantle (Buxton) and Miss Celia A. Swann (Rayleigh, Essex). The scholarships will enable the girls to undergo domestic science training before embarking upon a career in the electrical industry.

Productivity Conference

The British Productivity Council is holding a conference in conjunction with the Factory Equipment Exhibition from 14th to 16th April. There will be five sessions, tickets for each being £1 1s inclusive of entrance to the exhibition. Applications should be made to the Council, 21, Tothill Street, London, S.W.1.

Price Reductions

An average price reduction of approximately 19 per cent on its range of silicon rectifiers is announced by Ferranti, Ltd., with effect from 24th March.

Reductions in the prices of its multi-range meters, models 71A, 77A, 120A and 122A, have been made by Taylor Electrical Instruments, Ltd., Slough.

A.P.L.E. Change of Address

The Association of Public Lighting Engineers has moved to 76, Victoria Street, London, S.W.1 (telephone: Victoria 3655).

Trade Announcements

Midland Silicones, Ltd., has made arrangements for the distribution of silicone electrical insulating compound MS 4 throughout Scotland by R. D. Taylor & Co., Ltd., 9, Lynedock Street, Glasgow, C.2.

E. K. Cole, Ltd., have appointed Mr. D. Smith as radio sales representative for East Lancashire.

The Birmingham area sales office of the **Northern Aluminium Co., Ltd.,** is now at Devonshire House, Great Charles Street, Birmingham, 3 (telephone: Central 7393). The office continues under the management of Mr. D. W. Taylor.

Ferguson Radio announces that Mr. C. M. Fraser has now moved to 2, Park Villas, Roundhay, Leeds, 8 (telephone: Leeds 662147). The telephone number of Mr. Eric H. Carter, who covers the area comprising North Wales, Cheshire and North Staffs., is Irby 1686. His address is 18, Beaumaris Drive, Thingwall, Wirral, Ches.

The **Cambridge Instrument Co., Ltd.,** has appointed the B.S.E. Co., Ltd., Heddon House, 149-151, Regent Street, London, W.1, as its agents for Jugoslavia.

Caselco, Ltd., 46, Park Square, Leeds, 1 (telephone: Leeds 3-0285/6), have been appointed by **Twiflex Couplings, Ltd.,** a subsidiary of Sheepbridge Engineering, Ltd., the sole selling agents for Yorkshire for the complete range of "Twiflex" products.

A. C. Scott & Co., Ltd., have now completed their removal to their new factory on the Wythenshawe Industrial Estate. The new address is Roundthorn, Wythenshawe, Manchester, 23 (telephone: Wythenshawe 5533/4).

The new and larger offices of **Associated Lead Manufacturers, Ltd.,** have now been completed and the various departments of the company previously housed at Finsbury Circus and Ibex House are now at Clements House, 14-18, Gresham Street, London, E.C.2 (telephone: Monarch 4400). **Associated Lead Manufacturers Export Co., Ltd.,** has also moved to Clements House.

The Induction Heating Department of the **British Geco Engineering Co., Ltd.,** has moved to new and larger premises at Station Road, Edenbridge, Kent. The new premises include manufacturing, assembling, testing and development facilities.

Left to right: Mr. S. A. Clodd (executive director, E. K. Cole, Ltd.), the Burmese Ambassador, the Minister of Industries, Mr. E. K. Cole and Mr. W. M. York (background), commercial director

Metropolitan-Vickers Electrical Co., Ltd.

TURBINE-GENERATOR sets commissioned throughout the world in 1957 by the Metropolitan-Vickers Electrical Co., Ltd., have a total capacity of more than a million kilowatts. In Great Britain, nine machines were commissioned for the Central Electricity Authority with a total capacity of 662 MW. Among these were the second, third and fourth 100 MW, 3,000 r.p.m. sets installed at Castle Donington and 60 MW sets were put on load at Portishead "B," North Wilford, Chadderton, and South Denes power stations. In addition to these close-coupled two-cylinder machines, a three-cylinder 52·5 MW set was installed at Deptford East. With the exception of Deptford East and South Denes, all the stations mentioned have condensing plant and feed heating equipment supplied by the company.

In Canada, two 33 MW, 3,600 r.p.m. hydrogen-cooled sets were put into service at Brandon (Manitoba Hydro-Electric Board), and a 30 MW, 3,600 r.p.m. single-cylinder set went into operation at Estevan (Saskatchewan Power Corporation). In Rhodesia, the first of two 30 MW, 3,000 r.p.m. two-cylinder machines was commissioned at Salisbury No. 3 station, and the fifth 20 MW set went into service at Umniati. Other major units put into operation overseas included the fourth 20 MW set supplied since 1945 for the China Light & Power Co.'s Hok Un station.

The output of main generating plant ordered by the C.E.A. totals 720 MW. This includes two 200 MW reheat turbines and water-cooled generators for Willington "B," the condensers for which will each have a surface of 110,000 sq ft, and four 80 MW mixed-pressure sets for Berkeley, the nuclear power station now being built in Gloucestershire by the A.E.I.-John Thompson Nuclear Energy Co., Ltd.

One overseas order, from the British Columbia Electric Co., obtained against competition from American, German and Swiss manufacturers, covers the supply of six 150 MW, 3,600 r.p.m. steam turbine-generator sets for Vancouver, Canada. This $30 million contract is the largest single order for turbine-generator equipment ever received by the company. Other large overseas orders include two 150 MW sets for Calgary Power, Ltd., Canada, and two 120 MW, 3,000 r.p.m. sets with auxiliary equipment as part of the order for the complete Yallourn "E" power station of the State Electricity Commission of Victoria, Australia.

Nine turbine-generators, with an aggregate capacity of 63 MW, commissioned for industrial firms during the year included a 20 MW condensing set and a 17 MW back-pressure machine for Imperial Chemical Industries, Ltd., Billingham, and an 11·2 MW back-pressure set for Tate & Lyle, Ltd., at Plaistow. Two generators of 23·4 MW and 15·5 MW were dispatched to I.C.I., Thornton.

Waterwheel Generators

Two 50 MW, 428 r.p.m. vertical shaft waterwheel generators were exported to Norway. Machines in manufacture include five of 100,000 kVA (166·7 r.p.m. vertical, Francis turbine drive) for Bhakra Dam, India; and five of 111,111 kVA (166·7 r.p.m. vertical) for the Kariba power station of the Federal Power Board of Rhodesia and Nyasaland.

A 50 MVA, 1,000 r.p.m. air-cooled synchronous condenser made for the Torrente substation of the Cia. Hidroelectrica Espanola was shipped to site during the year. Two 30,000 kVA, 1,000 r.p.m. machines for Spain are in manufacture, one for the San Vincente substation of the Cia. Hidroelectrica Espanola and the other for the Herrera substation of Saltos del Sil S.A.

The new transformer factory at Wythenshawe, was officially opened by the Duke of Edinburgh last November. Two 120 MVA three-phase 132/275 kV auto-transformers

Hydrogen-cooled 100 MW turbo-generators at Castle Donington

Two 30 MVA synchronous condensers at Majadahonda, Spain

and two 106 MVA 13·8/295 kV generator transformers were supplied during the year for connection to the supergrid. Other units completed for the C.E.A. included 72 MVA and 60 MVA 132 kV transformers.

For overseas, seven 13·333 MVA single-phase 220 kV transformers were supplied to the State Hydro-Electric Department of New Zealand, these being arranged to form 40 MVA three-phase groups with off-circuit tapping switches and water-cooled oil coolers. A 9,450 kVA three-phase 50 c/s 22 kV voltage regulator fitted with a type M21 on-load tap changer (15 per cent in 15 steps) has been supplied to Greece and three 12 MVA units of voltage ratio 26·4/13·8 kV for Argentina. A large booster equipment in hand for power flow control (90 MVA three-phase 132 kV) consists of a voltage regulating transformer and a series transformer mounted in one tank.

A 150 kVA three-phase 11 kV transformer with Class H insulation was built and tested. Although there is an increasing desire to eliminate oil in certain applications because of fire risk, the cost of this type of insulation is high. As an alternative, transformers using more normal insulation and filled with non-inflammable fluid instead of oil were built in increasing quantities during the year with ratings up to 1,000 kVA.

Orders for the home market included a 225 MVA three-phase 16·5/295 kV transformer for the C.E.A. with tappings on the h.v. side for ±10 per cent in fourteen steps—the largest transformer yet ordered from M-V. Its five-legged core will be of cold-reduced oriented steel, the supply of which has improved and which is expected shortly to be received in coil form, ready for slitting into any required width. Also ordered for the C.E.A. were two 144 MVA units (13·8/144·6 kV). All these transformers will have on-load tap-changing gear with local and remote control. Cooling will be by means of separate oil-to-water heat exchangers. More 120 MVA auto-transformers (132/275 kV) were ordered by the C.E.A. as well as several 72, 60 and 45 MVA units for the grid.

Seven 49·3 MVA single-phase transformers were ordered for Australia to form two 148 MVA three-phase groups (and a spare unit), voltage ratio 13·8/345 kV, but supplying power initially at 230 kV. Off-circuit tappings will compensate for supply variations of minus 2½, 5, 7½ and 10 per cent and cooling will be by forced oil circulation and air blast.

During the past year development and testing at 330 kV of type GA11W8 air-blast circuit-breakers has been completed, and the first units have been dispatched to Australia. An order was received for the Electricity Trust of South Australia for the supply of twelve 275 kV, 3,500 MVA type GA10X8F air-blast circuit-breakers, and their associated current transformers for installation at Port Augusta "B" and Magill substations. Orders have been received from the Federal Power Board of Rhodesia and Nyasaland and the Rhodesia Congo Power Corporation for five 220 kV, 5,000 MVA type GA9W8 air-blast circuit-breakers for installation at the central switching station at Kitwe, Northern Rhodesia. Two of these breakers will be used to control the incoming 330/220 kV transformer feeds from the Kariba power station. Nine 230 kV, 7,500 MVA type GA9W8 air-blast circuit-breakers are designed for extensions to the Iberduero system in Spain.

The company is to supply and erect three 275 kV, 7,500 MVA type GA10W8 air-blast circuit-breakers for installation at Tilbury and fifteen 132 kV, 3,500 MVA type GA6W4 air-blast circuit-breakers for Gloucester.

Among the orders for high-voltage oil circuit-breakers received was one for eight 132 kV, 3,500 MVA type HG6MA oil circuit-breakers with associated isolators for the Eastern Division of the C.E.A. to extend the existing station and equip a new substation at Great Yarmouth.

One of the more interesting orders received for vertically isolated type VH switchgear is that received from the Selection Trust for the Mufulira West Copper Mine, Northern Rhodesia, which includes twenty-nine 11 kV, 350 MVA type V22H units with compound-filled double busbars. The units will be arranged in "U" formation to provide maximum visibility for instruments and meters.

The growing use of 3·3 kV air-break switchgear for power station auxiliaries is reflected in the order for sixty-five 3·3 kV, 150 MVA type HSA units for a new generating station at Elland, Yorkshire.

Many developments in relays and protective gear have been completed during the year. A negative phase sequence relay (type UA) for the protection of large a.c. generators has been developed to simulate the heating-time characteristic of the machine. Business generally for both protective and control relays has been well maintained and of the many contracts received one of the most important is for protective gear for the Manchester-Crewe section of the British Railways electrification.

For Kariba power station, five machine control boards containing turbine automatic control and generator automatic voltage regulator equipments are being produced. Five similar unit boards contain machine auxiliary starters and "start" boards for station auxiliaries. Automatic starting and stopping of machines and their auxiliaries is remotely initiated via supervisory equipment, which also controls the turbine speeder gear and voltage regulator.

Detailed design and engineering work are well advanced for the instrumentation of the boilers and blowers for Berkeley nuclear power station. Development work on the unique system of computer display for burst slug detection equipment is now complete and detailed design work is under way.

Electric Drives

Among a.c. motors completed were a 3,000 h.p., 490 r.p.m., 11 kV "AIF" winder drive for Manton Colliery and one of 2,600 h.p., 493 r.p.m., for the New Consolidated Goldfields at Doornfontein, South Africa. Two 1,250 h.p., 150 r.p.m., 3·3 kV "AIS" synchronous induction motors for driving ball mills in Rhodesia have a high starting torque with a low starting current and are arranged to run at unity power factor. The largest d.c. machines shipped during 1957 were three double-armature reversing mill motors rated at 8,000/22,000 h.p. 800 V 65/160 r.p.m. for Dorman Long & Co., Ltd.

The establishment of the mercury-arc rectifier/invertor control systems for winders has resulted in orders for motors of special construction. The scheme of control involves reversal of the motor field; this requires a laminated yoke and other special features to reduce the effect of eddy currents on flux reversal. Winder motors are in hand for the Peckfield, Silverhill, Ellistown, Parkside and Agecroft collieries of the N.C.B. where mercury-arc rectifier/invertor winders are being installed. The motors for Parkside and Agecroft are each of 2,500 h.p., 800 V, 530 r.p.m. and are designed to have a low inertia.

A number of equipments are being provided for automatic co-ordinate setting using punched paper taped digital information on a variety of machines. A fully automatic 360 deg, two-dimensional electronic copying equipment has been fitted to a large Holbrook lathe and supplied to A.W.R.E.

A set of eight high-frequency vacuum induction furnaces with two 150 kW, 2·25 kc/s motor-generator sets is being made for the United Kingdom Atomic Energy Authority. Furnace selector switches permit any one of a bank of four furnaces to be connected to one of the generators, giving maximum utilisation of the generators.

A general-purpose electronic analogue computer, the "Metrovick 952," has been developed. It is built on the unit principle: a cubicle containing ten operational amplifiers; a power unit; and a display unit. It is thus readily transportable and easily increased in size.

In July last, the South African Railways and Harbours Administration announced that a contract for 135 electric locomotives (worth over £7½ million) was to be placed with the company.

Ten 3,000 h.p., 80 ton, 25 kV, 50 c/s single-phase locomotives (Bo-Bo) have been ordered for operation on the London-Manchester-Liverpool routes which are being electrified under the first stage of the British Railways modernisation plan.

The company collaborated in the design, and was the main contractor for, the construction of "ZETA," the apparatus with which the United Kingdom Atomic Energy Research Establishment achieved the world's first controlled thermonuclear reaction in August, 1957.

International Meeting of Domestic Appliance Manufacturers

A DELEGATION from the British Electrical and Allied Manufacturers' Association attended a meeting in Paris from 13th to 15th March to discuss with other European domestic electrical appliance manufacturers the formation of an international committee to consider problems of mutual interest. Representatives of the six "Messina" countries (Belgium, France, Holland, Italy, Luxembourg and Western Germany) were present, as well as representatives of Switzerland and the United Kingdom; about 100 attended altogether.

After free discussion it was decided to establish a provisional committee to study the formation of an appropriate international body to consider questions of interest to the domestic electrical appliance industries in all countries represented, arising from the formation of the Common Market and the projected Free Trade Area. The first meeting of this committee will take place in June in Paris. The feeling was evident at the conference that even if the Free Trade Area did not come into being, there was still a tremendous amount of useful work which could be done by an international body of the kind envisaged.

The British delegation consisted of Messrs. R. Berry (Berry's Electric, Ltd.; member of the B.E.A.M.A. Council); J. Stevens (director, Rheostatic Co., Ltd.); K. Taylor (director, Santon, Ltd.; chairman, Domestic Electric Water Heater Section, B.E.A.M.A.); W. M. Tribute (export publicity manager, Hoover, Ltd.; chairman, B.E.A.M.A./D.E.A. Export Committee); Ivor Williams (General Electric Co., Ltd.; chairman, Domestic Electric Cooker Section, B.E.A.M.A.); Felix A. Rogers (head of Apparatus and Installation Equipment Department); and T. Counter (secretary, D.E.A., D.E.C. and D.E.W.H. Sections, B.E.A.M.A.).

At an official dinner given to the delegates on 14th March, the Deputy Mayor of Paris reiterated the general feeling of the meeting with regard to the formation of such a body, and the delegates met the Mayor of Paris at the Hotel de Ville and were conducted round that magnificent building.

Delegates to the international conference of domestic electrical appliance manufacturers in Paris

OVERSEAS ELECTRICAL TRADE

REDUCED CABLE EXPORTS IN FEBRUARY

BRITISH electrical exports in February fell off somewhat after their good showing in January, and the total value of £18·3 million was £1·7 million less than for the preceding month and about £1,000,000 less than for February last year. The biggest fall, as compared with the corresponding month of last year, was in the cables and wires group which at £2,050,759, showed a decline of about £900,000. Other categories showing a decrease as compared with last year were radio and associated equipment which fell by about £200,000, and converting machinery, mercury-arc rectifiers, transformers, etc., which showed a falling-off of over £250,000. In the generating sets, generators, etc., group, there was a rise of nearly £500,000, and telegraph and telephone equipment also improved by about £300,000.

In the generating plant class, Canada made purchases of £345,610; India £320,998; South Africa, £292,851; and New Zealand, £259,982. South Africa was the leading market for converting machinery, mercury-arc rectifiers, transformers, etc. (£453,974) with India second (£368,255).

A notable advance in the radio and associated equip-

TABLE I.—ELECTRICAL EXPORTS

Class	Month of February, 1958	Two months ended February, 1957	Two months ended February, 1958
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW	145,110	262,743	258,608
Ditto, 10 to 65 kW	188,699	266,819	354,223
Ditto, 65 to 200 kW	240,749	161,929	398,963
Ditto, over 200 kW	212,422	675,832	547,420
Spark ignition engine driven	17,196	20,750	31,388
Steam turbine driven	105,616	45,208	121,851
Hydraulic turbine driven	—	—	—
Other prime mover driven	13,228	27,851	29,708
Generators, not exceeding 200 kW	172,833	310,766	358,707
Ditto, over 200 kW	119,982	176,224	218,090
Parts of generators	725,859	633,224	1,210,657
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ½ h.p.	120,410	365,104	275,891
Over ½ but under 1 h.p.	48,564	102,019	135,676
1 h.p. to 250 h.p.	479,700	1,003,227	1,019,873
Over 250 h.p.	56,665	249,174	197,015
Railway, tramway and trolley-bus motors complete and parts of all motors	329,051	311,740	538,928
Motor starting and controlling gear	226,139	569,501	536,884
	3,202,223	5,182,111	6,233,882
Converting machinery	38,738	167,029	82,861
Mercury-arc rectifiers	100,736	56,950	206,522
Transformers for lighting, heating and power (incl. coils):			
Not exceeding 7,500 kVA	703,660	1,076,027	1,425,289
Over 7,500 kVA	422,137	442,183	707,851
Switchgear and switchboards (not telegraph or telephone), up to 200 A and 660 V	407,331	616,787	973,688
Ditto, other	854,969	2,344,440	1,924,321
	2,527,571	4,703,416	5,320,532
Primary batteries:			
Lighting	88,845	192,556	188,890
Radio	276,130	592,421	560,556
Other	41,839	92,418	97,174
Parts (excl. carbons)	49,936	98,266	102,003
Lamps:			
Filament, exceeding 28 V	85,020	163,593	179,792
Ditto, under 28 V	34,460	74,071	57,433
Arc lamps and searchlights	22,350	22,490	37,362
Discharge lamps, fluorescent tubes, etc.	97,278	207,382	182,575
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury arc rectifiers), photo-electric cells, stabilising and cold cathode valves, magnetrons, klystrons	19,791	50,226	48,675
All other	389,649	552,433	718,043
Parts (excluding glass bulbs)	17,133	18,225	30,320
Radio and television transmitters	51,324	194,341	78,884
Commercial radio and radar equipment	1,068,821	2,361,713	2,352,810
Domestic radio receivers, mains	87,108	196,832	169,933
Ditto, battery	50,030	101,398	109,630
Ditto, other (incl. car)	24,232	47,154	60,955
Radiograms	36,013	49,190	87,863
Television sets	121,655	112,027	245,304
Public address equipment	102,642	196,332	212,801
Other radio and television apparatus, n.e.s.	24,614	126,657	50,191
Components and parts, n.e.s.	769,513	1,629,994	1,557,315
	2,762,525	5,636,522	5,722,724
Telegraph and telephone installations	820,918	1,412,511	1,923,361
Telephone instruments, separately consigned	209,717	304,673	477,552
Telegraph and telephone parts	806,897	1,668,254	1,543,336
Line apparatus for long distance communication	192,346	196,682	354,325
	2,029,878	3,582,120	4,298,574

Class	Month of February, 1958	Two months ended February, 1957	Two months ended February, 1958
	£	£	£
Cookers	53,628	132,533	111,440
Toasters	13,933	25,475	45,297
Other cooking apparatus	32,741	62,262	71,456
Parts and accessories	52,513	144,018	125,195
Space heating appliances	39,186	77,804	79,159
Water heating appliances	26,492	53,773	48,274
Other heating appliances	52,006	75,096	87,679
Parts and accessories	54,840	132,747	111,399
Irons	63,843	114,498	183,953
Arc welding equipment, a.c.	88,893	125,127	173,154
Ditto, d.c.	29,995	106,941	54,587
Resistance welding equipment	16,560	34,840	28,528
Electric furnace plant	66,697	194,835	143,730
Magnetos, ignition	13,586	74,844	33,703
Sparking plugs	176,780	340,240	301,691
Elec. appliances for aeroplanes, n.e.s.	290,045	500,627	533,586
Ditto, for motor vehicles, n.e.s.	359,857	717,693	742,246
Ditto, for cycles, n.e.s.	51,676	93,456	108,836
Signalling app. (incl. traffic signals)	168,587	183,269	355,039
Instruments, commercial	188,117	365,168	350,515
House service meters (including parts)	166,989	357,787	332,513
Electro-medical apparatus (not X-ray)	25,623	58,937	75,754
X-ray apparatus (excl. tubes and valves)	36,316	125,444	100,406
Vacuum tubes	57,349	104,427	97,526
Ceiling fans, complete	95,749	213,660	174,363
Desk fans, complete and parts of desk and ceiling fans	27,258	69,881	62,196
Vacuum cleaners	93,585	316,398	279,211
Floor polishers	82,281	146,992	151,202
Food mixers	53,645	101,138	100,242
Hair clippers and dry shavers	41,409	202,563	126,352
Other portable appliances	21,941	56,388	48,860
Parts	122,222	247,577	289,213
Portable elec. tools (not saws) and parts	212,091	459,897	474,475
Cables and wires:			
Telegraph and telephone, submarine	112,559	98,072	126,610
Ditto, other	448,003	1,895,999	1,489,652
Cotton, silk or art. silk insulated	48,999	81,320	81,251
Enamel, glass or asbestos insulated	55,266	195,911	154,397
Paper insulated	407,009	1,405,573	1,063,692
Rubber insulated	560,403	1,259,990	1,138,813
Thermoplastic insulated	197,264	299,774	447,940
Other	221,256	380,166	526,635
	2,050,759	5,616,805	5,028,990
Accumulators for motor vehicles	123,385	292,698	250,752
Ditto, traction	30,302	62,868	44,290
Ditto, radio and other portable	66,342	166,067	111,616
Ditto, other	22,095	54,108	52,868
Parts and accessories	103,558	211,824	222,423
Electric wiring accessories	130,423	71,632	226,686
Elec. porcelain, etc. (incl. insulators), n.e.s.	123,877	219,108	207,625
Insulating cloth and tape	48,130	132,309	98,213
Other insulating material	90,990	192,406	187,751
Permanent magnets	58,051	88,058	101,619
Radio, telegraph and telephone testing equipment, n.e.s.	54,943	121,041	107,433
Scientific elec. instruments (not telegraphic or telephonic):			
Time recorders and time switches, complete	28,748	18,753	58,756
Other	332,912	651,471	640,787
Electrical machinery, n.e.s.	67,620	135,481	154,795
Electrical apparatus and appliances, n.e.s.	849,097	1,738,469	1,842,388
TOTAL	18,275,620	36,334,799	38,320,269

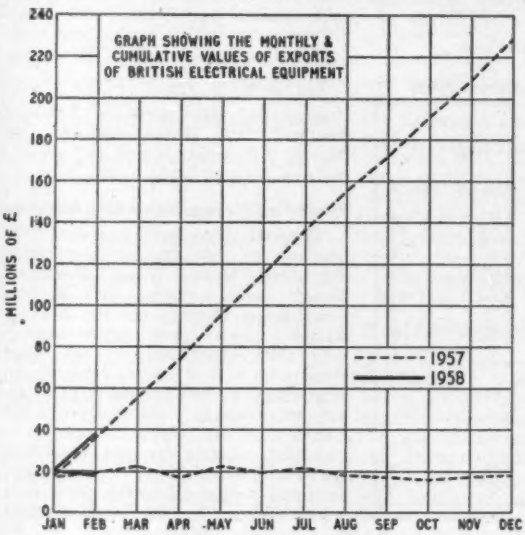
TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	February, 1958	Two months ended February, 1957	Two months ended February, 1958
	£	£	£
Channel Islands	83,561	222,173	198,158
Gibraltar	71,077	19,141	98,473
Malta and Gozo	90,720	77,097	131,329
Cyprus	107,593	259,243	204,104
Sierra Leone	50,644	61,744	118,355
Ghana	126,301	346,392	317,859
Nigeria	265,537	593,721	609,195
Union of South Africa	1,658,417	2,890,147	3,436,233
Rhodesia and Nyasaland	501,745	1,007,618	998,883
Tanganyika	46,428	118,115	99,198
Kenya	143,077	540,635	301,427
Uganda	62,837	205,011	150,541
Mauritius	21,458	86,144	42,947
Aden	65,942	106,326	119,413
Bahrain, Qatar and Trucial States	53,119	375,273	165,631
Kuwait	127,234	509,971	333,924
India	1,389,146	4,207,700	3,155,911
Pakistan	272,858	469,551	603,546
Singapore	366,884	668,534	636,013
Federation of Malaya	341,950	684,134	612,612
Ceylon	123,315	343,893	247,768
British North Borneo	19,706	48,171	50,803
Sarawak	15,745	38,410	27,849
Hong Kong	358,459	486,151	594,332
Australia	1,459,224	3,227,829	3,555,922
New Zealand	1,309,197	1,962,747	2,707,531
Fiji	48,334	38,308	71,217
Canada	901,296	1,798,001	1,750,601
Jamaica	164,374	158,037	289,322
Barbados	34,933	44,099	56,518
Trinidad	137,054	230,419	239,337
British Guiana	38,903	81,384	72,047
Other Commonwealth countries	249,603	186,990	385,187
Irish Republic	261,869	429,938	531,229
Soviet Union	3,192	372,228	58,969
Finland	164,335	215,184	349,176
Sweden	507,021	697,286	865,132
Norway	223,539	432,812	447,933
Denmark	176,679	375,825	374,779
Poland	52,665	86,249	189,326
Western Germany	183,880	464,950	418,376
Netherlands	669,527	1,379,121	1,257,474
Belgium	283,566	667,348	604,120
France	304,329	895,260	721,691
Switzerland	132,738	237,739	258,973
Portugal	426,005	430,330	948,899
Spain	208,717	738,340	386,817
Italy	298,128	512,106	598,743
Austria	23,355	46,077	85,422
Yugoslavia	40,734	86,239	97,243
Greece	106,419	195,719	237,966
Turkey	70,570	124,974	157,065
Belgian Congo	31,489	88,778	72,200
Portuguese East Africa	18,270	51,178	36,094
Egypt	119,119	593	140,778
Libya	57,156	48,959	105,364
Southern Morocco	43,443	124,488	57,893
Sudan	123,992	277,381	182,386
Syria	23,332	68,037	44,384
Lebanon	90,182	60,715	152,078
Israel	79,558	163,689	168,238
Jordan	109,341	92,927	154,950
Saudi Arabia	56,700	67,099	184,641
Iraq	242,498	450,293	647,379
Iran	189,974	385,172	729,823
Burma	62,708	124,318	162,086
Thailand	204,391	166,228	406,741
Indonesia	38,401	118,722	70,174
Japan	52,361	110,979	91,712
United States of America	570,301	1,336,495	1,141,686
Cuba	57,948	60,824	196,480
Mexico	54,803	114,239	117,525
Colombia	62,342	84,100	114,276
Venezuela	420,774	591,887	913,808
Peru	35,049	97,618	75,472
Chile	19,232	88,669	65,145
Brazil	161,906	158,117	262,604
Uruguay	4,346	40,502	10,840
Argentine Republic	269,726	153,838	458,036
Other foreign countries	232,339	728,120	585,957
TOTAL	18,275,620	36,334,799	38,320,269

ment group was in the value of exports to Sweden whose purchases in February amounted to £254,351, as compared with only £130,545 in February last year. The Netherlands also increased its purchases from £180,563 in February, 1957, to £242,479 last month. The best Commonwealth country was Australia which took equipment valued at £193,048.

The two leading Commonwealth markets for telegraph and telephone material were Australia (£295,539), and New Zealand (£216,484), while outside the Commonwealth Portugal made purchases of £249,274 (against £96,261 in February, 1957).

The main causes for the decline in shipments of electric cables and wires were the reduced purchases of India, which at £208,938, were some £400,000 below the February, 1957, figure, and the United States which bought only £30,281 (against £310,905 last year). The best market last month was New Zealand, which took supplies valued at £234,495. Venezuela was prominent in the list with purchases of £184,637 (against £84,371 in February, 1957). The equipment shown in the electrical section of the Board of Trade returns is detailed in Table I, and the destinations of exports are given in Table II.



Other electrical equipment shown elsewhere in the returns includes the following:—

Electric locomotives: February, £394,275; two months (January-February), £534,043 (against £639,997).

Locomotives with i.c. engines and electrical transmission: February, £175,062; two months, £321,838 (£324,487).

Electrically operated washing machines, complete, not exceeding 150 lb net weight: February, £426,799; two months, £689,384 (£650,924). Ditto, 150-250 lb: February, £61,468; two months, £136,714 (£206,930). Parts: February: £75,438; two months, £125,809 (£128,790).

Welding electrodes (excluding carbons), covered: February, £141,282; two months, £247,526 (£241,985).

Electric conduit tubes and cased tubes: February, £63,592; two months, £108,680 (£176,845).

Electric carbons (including parts): February, £44,195; two months, £103,280 (£111,628).

Electric lighting fittings and lanterns, complete, with or without bulbs (excluding arc lamps, searchlights, and cycle lamps): February, £250,196; two months, £523,766 (£393,294).

Other electric lighting appliances (excluding vacuum tubes and lamp bulbs) and fittings and parts, n.e.s.: February, £100,453; two months, £265,762 (£535,723).

Electrical imports in February amounted to £2,134,842, as compared with £1,973,027 in February, 1957, and the total for the first two months of this year was £4,556,380 (against £4,229,436). The three leading import countries were the United States (£524,305), Western Germany (£411,907) and the Netherlands (£327,943).

GENERATION AND DEVELOPMENT

Treasury Advances

Advances to the Central Electricity Authority, under the terms of the Finance Act of 1956, in the period to 31st March last year amounted to £148 million, and to the Gas Council to £24 million, according to a White Paper published on Monday.

The Act enabled advances to be obtained from Ministers by the nationalised industries, instead of borrowing by the issue of stock.

The announcement of these advances by the Minister of Power completes publication of the amounts paid out to the nationalised bodies up to the end of last March. The total, as announced a week ago in a report by Sir Frank Tribe, the Comptroller and Auditor-General, is £284,100,000.

Output Rise Again Exceeds 10 Per Cent

The latest return of the Ministry of Power shows that 11·1 per cent more electricity was generated in the first two months of this year than in the same period of 1957, last month's total being 8,726 million kWh (Central Electricity Generating Board 7,960 million, South of Scotland Electricity Board 557 million and North of Scotland Hydro-Electric Board 209 million). This rate of increase compares with an average of 4·4 per cent for the whole of last year; in January and February, however, because of the mild weather, output decreased by 2·8 per cent. Prevailing temperatures this year have been more normal, the average up to the end of February being 39·8 deg F against 41·9 deg F a year ago.

There was no change in installed capacity last month, the total remaining at 26,611 MW (see Table 1).

In addition to public supply, 1,743 million kWh was generated by industry in the eight weeks ended 22nd February, an increase of 2·8 per cent. This figure includes production at Calder Hall nuclear power station, which amounted to 47 million kWh.

Table 2 analyses the Area Boards' sales. The national figures show an increase over February, 1957, of 10·8 per cent, but when corrected for weather conditions and working days the increase is 9 per cent.

TABLE 1.—ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Elec. Generating Board	3,906	81	120·6	7,928	23	7,960	7,487	24,234
North of Scotland H.E.B.	13	—	1·4	21	182	209	208	912
South of Scotland E.B.	274	8	0·2	519	38	557	529	1,465
Total for February, 1958	4,193	89	122·2	8,468	243	*8,726	8,224	26,611
Corres. total for February, 1957	3,944	81	12·2	7,611	266	7,889	7,431	24,670
Inc. or dec., per cent	+6·3	+9·7	+898·5	+11·3	−8·8	+10·6	+10·7	+7·9
Total to date (2 months), 1958	9,132	191	247·6	18,267	502	18,802	17,721	
Total for corres. 2 months of 1957	8,547	178	26·4	16,336	558	16,919	15,935	
Inc. or dec., per cent	+6·9	+7·4	+837·1	+11·8	−10·1	+11·1	+11·2	

* The total figure includes generation by other methods amounting to 15 million kWh.

TABLE 2.—ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for February (Million kWh)			Twelve Months Totals Ended 28th February (Million kWh)		
	1957	1958	Inc. or Dec. %	1957	1958	Inc. or Dec. %
London	663·8	724·9	+ 9·2	6,897·1	7,267·9	+ 5·4
South Eastern	404·4	461·8	+14·2	4,418·0	4,742·4	+ 7·3
Southern	506·4	583·7	+15·3	5,410·0	5,976·4	+10·5
South Western	244·8	265·7	+ 8·5	2,741·3	2,925·8	+ 6·7
Eastern	658·2	741·5	+12·7	7,071·1	7,675·6	+ 8·5
East Midlands*	546·1	599·2	+ 9·7	6,045·7	6,477·7	+ 7·1
Midlands*	707·9	795·8	+12·4	7,732·6	8,328·1	+ 7·7
South Wales*	395·5	418·4	+ 5·8	4,528·5	4,857·9	+ 7·3
Merseyside and North Wales*	419·3	453·9	+ 8·3	4,748·1	5,071·9	+ 6·8
Yorkshire*	710·7	770·4	+ 8·4	7,879·7	8,426·1	+ 6·9
North Eastern*	403·8	447·2	+10·7	4,541·7	4,894·6	+ 7·8
North Western*	734·4	801·4	+ 9·1	8,249·3	8,673·9	+ 5·1
Total all Area Boards	6,395·3	7,063·9	+10·5	70,263·1	75,318·3	+ 7·2
Direct Supplies by C.E.G.B.	183·0	222·5	+21·6	2,217·3	2,530·0	+14·1
Grand Total	6,578·3	7,286·4	+10·8	72,480·4	77,848·3	+ 7·4
Mainly Industrial Areas*	3,917·7	4,286·3	+ 9·4	43,725·6	46,730·2	+ 6·9
Mainly Non-Industrial Areas	2,477·6	2,777·6	+12·1	26,537·5	28,588·1	+ 7·7

* Those in which industrial consumers took over 30 per cent of the total sales in the preceding financial year.

Ten Years' Achievement

The March issue of *Public Service*, the journal of the National and Local Government Officers' Association, contains a four-page supplement devoted to the achievements of the electricity supply industry during the first decade of nationalised operation. The object of the Association, we are told, is "to contribute towards public knowledge and understanding of the progress of the electricity supply industry, in which many of its members work." It is shown in the supplement how little the price of electricity has risen in comparison with the costs of other services and commodities; how rapidly progress has been made; and what economies have been achieved through co-ordination. There are a number of diagrams to illustrate these points. A page of the supplement deals with the human side of the industry with its 180,000 employees. It is stated that the journal has a circulation of 273,000 and that the supplement will be seen by between half a million and a million people.

Carolina Port Gas Turbine

Out of action since 1955, the experimental 12,500 kW closed cycle gas turbine at the power station at Carolina Port, Dundee, will be ready for new tests this summer. The only other machine of its kind in the world is in Paris.

The turbine, which was built by John Brown & Co., Ltd., Clydebank, to the designs of Escher Wyss & Co., Zurich, broke down in 1955 when it was connected to the power system and carried part load. Mechanical defects were encountered. New blading and other equipment have now arrived from Switzerland.

Mr. R. B. Anderson, Dundee Area manager of the North of Scotland Hydro-Electric Board, said on 14th March that it was hoped to have the turbine in operation by June.

Board's Spring Sales Conferences

The first of the series of spring sales conferences organised by the Merseyside and North Wales Electricity Board took place at Bangor, Caernarvon District, on 4th and 5th March. There were approximately fifty sales representatives and staff present for each of the two conferences, which were opened by Mr. R. N. Pegg, sub-area manager. After opening the conference Mr. Pegg introduced a recorded address by the chairman, Mr. D. H. Kendon. The programme included a home laundry session in which Miss E. V. Jones, senior

demonstrator, No. 4 Sub-Area, dealt with the subject "What is available in Electric Dryers?" This was followed by a talk by a Hoover sales executive on the subject "Selling the Technique of Spin Drying." Mr. J. L. W. Ladner, the Board's Education and Training Officer, gave a talk on "Service Centre Staff Training and the Future," Mr. W. Gilchrist, chief commercial officer, outlined the Board's sales policy and Mr. T. R. Smith followed with a talk on its promotional publicity for electricity and electrical appliances. The proceedings concluded with an open forum. Following the conferences at Bangor, a similar programme was repeated at the Royal Institution, Colquitt Street, Liverpool, on 10th March.

Industrial Tariff and Maximum Demand

A request put forward by an engineering company for a special agreement which would permit a day-time period during which equipment could be tested without attracting the maximum demand rate was considered by the Southern Electricity Consultative Council whose fiftieth ordinary meeting was held at Reading last week under the chairmanship of Group Capt. J. C. M. Hay. The Council's information was to the effect that there was only a comparatively small falling-off of load in the day-time between the hours of noon and 4 p.m. and it was essential to make use of this brief and shallow dip to assist consumers who were otherwise prepared to use their installations solely at night or during the summer but who needed a short boosting period during the day which could be confined to about 2½ hours. Accordingly the Council was of the opinion that no case for a special agreement had been made out by the company concerned, and it was decided to make no recommendation to the Board.

Tax on Domestic Appliances

At the same meeting the Council passed a resolution in which it urged the Chancellor of the Exchequer to remove purchase tax on electrical domestic appliances, pointing out that oil-burning domestic appliances were free of tax in spite of the effect of oil consumption on our dollar reserves.

Falkirk's New Service Centre

The accompanying picture shows a window display specially arranged in the new electricity service centre in Newmarket Street, Falkirk, to support the first full week's programme of cookery demonstrations in the demonstration theatre, on a Carron "L.75" electric cooker. Mr. J. G. Curtis, the Stirling area manager of the South of Scotland Electricity Board, and Mr. J. I. Paton, sales manager of Carron Company, welcomed a large audience to the opening demonstrations on 17th March. The demonstrations are being given by Miss Heron, head of the Domestic Science Department of Carron Company, and her assistant, Miss George, and are attracting a great deal of local interest.

Carron cooker display in the new electricity service centre at Falkirk

Tariff Assessment Complaint

At a meeting of the Yorkshire Electricity Consultative Council in Doncaster a resolution was passed urging the Board to reconsider its attitude in assessing the tariff for the new type of through-lounge house being built on housing estates. It was stated that a number of complaints had been received from residents of the Hackenthorpe estate, Sheffield, that their through-lounge had been assessed as two rooms. If there was a projection in the room rising from floor to ceiling it was considered by the Board as two rooms and assessed as such, which meant that the tenant had to pay an extra 18s a year.

The chairman of the Council, Ald. William Leach, considered that in view of the modern trend in building the Board should review its assessment system. He was assured by Mr. A. Hazelhurst, chief commercial officer, that the Board was looking into the matter.

Commenting on reports of low voltage, Mr. Hazelhurst said that most of the people complaining had noticed the deficiency because they were not getting the best of reception on their television sets, although other household electrical equipment was not affected. The problem was one of the Board's biggest headaches, but it was not limited to Yorkshire. Until more capital was allocated the necessary system reinforcement could not be carried out.

New Electrical Applications in Guernsey

Additional load connected by the States of Guernsey Electricity Department last year included a floor warming installation in the new offices of the Tomato Marketing Board. Mr. Ian F. Young, M.I.E.E., the engineer and manager, adds that two other installations have been negotiated "and it is confidently expected that an extension of this class of heating will develop in the near future." Frozen food conservators provide another electrical application which is extending, and television receivers are estimated to produce a total load of 1,250 kW.

Last year began with a 6 per cent fall in output in the first quarter but the position improved later and for the whole year the number of kWh generated (31·1 million) was 3 per cent more than in 1956. A point of interest is that sales actually rose by 5·6 per cent to 26·3 million kWh, the narrowing of the gap between output and sales being brought about by the conversion from d.c. to a.c. and the systematic changing of consumers' meters.

Total income was £392,567 and the year's trading resulted in a net profit of £1,102. Fuel oil costs, which had risen appreciably, absorbed 38 per cent of the average price per kWh sold of 3·003d (against 2·299d/kWh in 1956). At the end of the year a temporary tariff increase was withdrawn and it is hoped that stabilisation of commodity prices will enable the present level to be maintained. Consumers served now number 13,390 against 12,695 at the end of 1956.

The Department's report contains an illustration of the latest Mirrlees-Brush diesel alternator sets and also photographs of a disastrous fire which occurred during the year at the Contracting Department's Bouet stores and workshops, destroying almost the entire stock.

Lake District Electrification

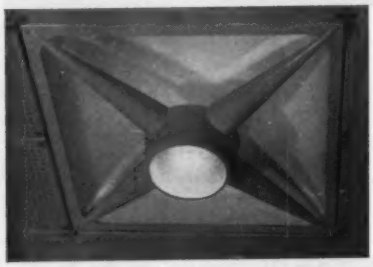
Under a new rural electrification scheme the Lakeland Sub-Area of the North Western Electricity Board has been divided into 48 zones, several of which will be included in each year's rural plans. The work in each zone will cost about £50,000 and the project for the entire Lakeland Sub-Area, involving the electrification of 7,000 premises including 3,500 farms, will cost £2,500,000. It is hoped to complete the work in less than ten years.

NEW ELECTRICAL EQUIPMENT

Ceiling Lighting Fitting

A square recessed domed tungsten-lamp fitting, for use in a 2ft module suspended ceiling, is one of the latest additions to the range of lighting fittings manufactured by COURTNEY POPE (ELECTRICAL), LTD., Amhurst Park Works, Tottenham, London, N.15.

The unit, type TA 82 and nicknamed "Sputnik," houses a centrally mounted lamp shield with a diffusing glass underside. It is designed for use with a 200 W lamp. The underside is finished in stove enamelled ivory with a matt-white dome. The cut-out size is 21½ in square.



Courtney Pope type TA 82 ceiling lighting fitting

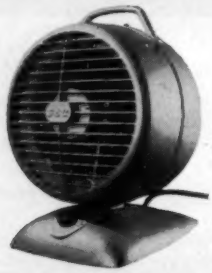
"Tropical" room air conditioner (Temperature, Ltd.)

Air Conditioner

The latest addition to a range of air conditioning units produced by TEMPERATURE, LTD., Burlington Road, London, S.W.6, is the nominal 1 h.p. hermetically sealed and water-cooled "Tropical" room air conditioner, designed for use in countries with relatively high humidities. It is provided with a "Sternette-Tecumseh" single-phase compressor (rated at 1,200 W) specifically wound for either 50 or 60 c/s. The three-row circular double-pipe contraflow condenser is constructed as a tube within a copper pipe and is cleanable. When used in humid atmospheres, uninsulated, it provides re-heat. An air-inducted electrostatic washable air filter and thermostat are also provided. The whole is enclosed in a sheet metal case 14in high by 28in wide by 11in deep. Draughtless air distribution is achieved by the provision of a circular adjustable air grille. The price is £132.

Fan Heater

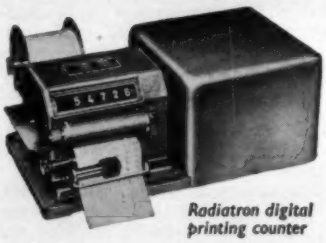
A floor model of their 3 kW fan heater is announced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. The portable heater will circulate 9,600 cu ft of warm air per hour, the temperature of air passing through the heater being raised by 59 deg F. A thermostat in the base controls the room temperature in the range 50 to 70 deg F.



G.E.C. 3 kW fan heater

In warm weather the fan can be run with the heating element switched off. An easily re-set safety cut-out protects the unit against overheating. The heater, which has a long-life element operating at black heat, is completely enclosed in a die-cast aluminium casing. The unit is adjustable for tilt.

A red lamp indicates when the unit is connected to supply. The unit, finished in champagne gilt, is available for single-phase a.c. supplies only: 200/210, 220/240 or 250 V. The list price is £16 13s 11d plus purchase tax of £8 6s 1d in the United Kingdom, making a total of £25.



Radiatron digital printing counter

Quartz Crystal Unit

A new rugged quartz crystal assembly to meet requirements for accurate frequency control where extreme conditions of acceleration and vibration are encountered has been developed by SALFORD ELECTRICAL INSTRUMENTS, LTD., Peel Works, Salford, Manchester, which is a subsidiary company of the General Electric Co., Ltd.

Units with this assembly, which is to be used for all standard crystals covering the frequency range from 2 to 36 Mc/s, will operate within the specified activity and frequency limits when subjected to the bump and vibration tests stipulated in Defence Specification DEF.5271 (RCS.11). Furthermore the units will also operate satisfactorily under the proposed new vibration conditions which have not yet been incorporated in the above specification.

For special applications quartz crystals can be supplied in the frequency range 2 to 5 Mc/s which will operate satisfactorily when the applied vibration is swept from 30 c/s to 2,000 c/s and the peak acceleration is maintained at 40 g.

Printing Counter

An electro-mechanical counter has been introduced by RADIATRON, 7, Sheen Park, Richmond, Surrey, to provide a permanent printed record of a variety of measurements. It is available in models to suit different applications. These include the counting of electrical impulses of closures of a switch up to a speed of 5/sec, the recording of elapsed time in units of 0·01 minute or in seconds, and the counting of revolutions of a shaft up to 50/sec. The count is printed in numbers of up to six digits on a paper roll 2¾in wide or on cards.

An automatically changed serial number or hand-adjusted code, consisting of two figures or letters, can be printed in addition to the counting digits. All the characters forming the code and digits are printed simultaneously.

The printing counter is a compact instrument 11in long, 6in wide and 4½in high and weighs approximately 11 lb. It can be supplied with fully automatic action, or with a hand-operated print lever. The printing, paper shifting and resetting operations are performed by an incorporated torque motor energised by electrical impulses.

Tool Breakage Alarm

The breakage of any steel tool, such as a drill, tap, or reamer, can be detected by a tool alarm, type N263, made by AIRMEC, LTD., High Wycombe, Buckinghamshire. The units consist basically of small detector coils which are fitted around the tools to be protected. These coils are connected to transistorised alarm units

which plug into sockets in the main machine control cabinet. The alarm units are printed circuit boards on which are mounted all the components, including a sealed output relay. Immediately a tool breakage occurs a signal is passed from the appropriate detector coil to its alarm unit and the output relay is energised. The relay contacts can be used for tripping the main power contactors and for switching alarm circuits.

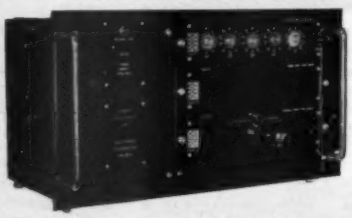
Two types of coils are available for tool sizes from $\frac{1}{4}$in to $\frac{3}{4}$in diameter and from No. 60 drill size to $\frac{1}{16}$in diameter. Power supplies for the alarm unit are obtained from a miniature power unit, type 267, which will operate up to 10 units.

Pilot Light

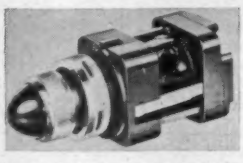
A push-to-test pilot light is announced by SQUARE D, LTD., 100, Aldersgate Street, London, E.C.1. The design of this device makes it possible to test the bulb simply by pushing the colour cap. Oil-tightness of the unit is maintained throughout the test operation. There are no wires to be broken within the unit as all internal connections are pressure connections of silver-plated beryllium copper. This push-to-test pilot light occupies the same panel space as the standard type T unit.

Low-Maintenance Time Switch

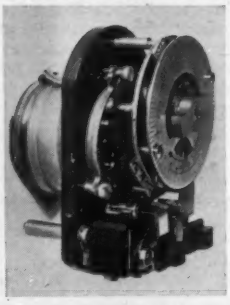
A time switch which has been designed to give maximum operating life under adverse conditions with a minimum of maintenance, combined with low initial cost, is announced by the AUTOMATIC LIGHT CONTROLLING CO., LTD., 100, Holdenhurst Road, Bournemouth. These features of the "Gunfire" time switch have been achieved by the combination of micro switching, totally enclosed motor gear train unit, and simplified solar dial. The electrical contacts are made of silver and the surface of the movable contact is formed in a series of ridges or serrations. Serrated contacts of this design have the same current carrying capacity as unserrated contacts and produce higher unit contact pressure. Contact bounce is eliminated and the greater pressure will cut through films which may have formed on the contact surfaces.



Dowty Mark IV electronic tachometer showing units in one cabinet



Square D push-to-test pilot light



"Gunfire" time switch (Automatic Light Controlling Co.)

Electronic Tachometer

Digital counting techniques, for the measurement of shaft speeds with extreme (±1 r.p.m.) accuracy, are utilised in the electronic tachometer, Mk. IV, made by the DOWTY GROUP, LTD., Cheltenham. Specially designed for incorporation in gas-turbine test bed consoles, it embodies a remote display head and remote switching unit requiring a minimum of panel space.

For laboratory or portable use, these remote units can be mounted in the main body of the equipment. The construction and component layout allow the equipment to be adapted to suit particular requirements, and versions are available catering for time measurements and speed ratios in addition to the normal tachometer functions. Front panel switches and knobs have been kept to the minimum to ensure easy operation by non-technical personnel. Front panel sockets provide for voltage and current checks, and a switched test meter unit can be supplied.

Transducers are available which use the electrical output of the tacho-generators normally fitted to gas turbines, thus enabling the tachometer to be installed and operated without modification to the gas turbine or auxiliary equipment.

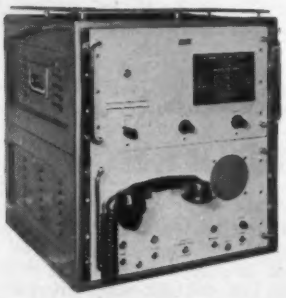
Recorder

A continuous roll chart instrument incorporating two quick response movements and recording electrically on "Teledeltos" paper is announced by EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.4. The movement zero may be set in any position, and a marker pen is incorporated. Internal illumination is provided.

Two models are available giving various chart speeds. These speeds are selected by a lever. The front of the recorder hinges open to form a run-out chute for the paper and a writing surface. The amplifier unit comprises a power pack and two amplifiers, and an 18-core connector 5ft long is provided. Power requirements are 115/230 V, 50/60 c/s (140 W) and 15/20 V d.c. (3 W) for operating the marker pen.

Records can be taken up to 25 c/s with an amplitude error not exceeding 10 per cent for a peak to peak deflection of 1½in. At smaller amplitudes the frequency response is proportionally higher. Under static conditions the linearity is within ±3 per cent and after warming up the drift is negligible. The sensitivity is ±5 V for full-scale deflection of ±1½in and can be adjusted down to zero by a potentiometer control. With this control in circuit the input impedance is approximately 50,000 Ω, and 2 MΩ with the control switched out.

Evershed quick-response recorder



RACAL type TRA.55 single sideband radio-telephone

Radiotelephone

A 60 W radiotelephone using single sideband transmission is announced by RACAL ENGINEERING, LTD., Western Road, Bracknell, Berkshire.

This TRA.55 set makes available the enormous effective gain in power given by s.s.b. transmission to the user who requires a small, compact, and inexpensive equipment. It may also be used for c.w. operation if required.

Four pre-set channels are provided and a single switch selects the transmitter and receiver channels simultaneously. To operate the equipment it is necessary only to switch on and select the required channel. The set will then be receiving. To transmit, a switch in the handle of the telephone handset is depressed. A built-in loudspeaker is provided with the equipment for use as an alternative to the telephone earpiece.

Financial Section

STOCKS and SHARES

A HIGHER level of prices has been established in most sections of the Stock Exchange since the cut in Bank Rate. In the gilt-edged market the change had already been to some extent discounted, but the announcement came sooner, and the reduction by a full 1 per cent was larger, than many people had expected. Many industrial share prices were marked up by a shilling or two, although the official warnings against attaching undue significance to the decision served to keep the movement within bounds. After the first reactions to the news, investment activity still remained small, but the improvement in prices was maintained, and the markets had as a whole a more confident appearance at the beginning of this week.

Higher Prices

Shares of the big electrical and atomic power groups showed up well in the general advance induced by the Bank Rate change. English Electric and Babcock & Wilcox both gained 2s or more. A.E.I., G.E.C. and Reyrolle were each 1s 3d higher; on the last named the final dividend was expected to be decided upon to-day (Friday). Clarke Chapman repeated the previous week's recovery of 5s. Among cable and telephone issues, B.I.C.C., Automatic Telephone, Telegraph Construction, Henley's and Ericsson were all prominent. Other improvements worthy of note were those in E. K. Cole, Lancashire Dynamo and Aerialite. Desoutter Bros. moved up to 14s after the news of increases in the profit and dividend for 1957. Telegraph Condenser were unaffected by the company's results. Cable & Wireless went ahead well, the premium on the new shares, offered at 5s, reaching about 4s.

Dividends Declared

Bakelite 10s shares, at 17s 6d, were little altered by the announcement of a final payment making a total of 15 per cent, the rate to which it was reduced (from 16 per cent) last year. They show a yield of a fraction over 8½ per cent. Profit for the year, after all charges, is £15,000 above the previous figure at £225,000, of which the preference and ordinary dividends absorb £164,000. Wolf Electric Tools report a reduction in the 1957 profits to £127,000, but this still leaves more than threefold cover for the 10 per cent ordinary dividend. This is equivalent to the distribution made last year on half the present capital, and gives a yield of over 7 per cent on the 5s shares at 7s. Franco Signs 10s shares were quoted higher at 14s 6d after the announcement of an increase in the dividend from 12½ to 13½ per cent. The yield on the shares in this case works out at 9¼ per cent.

Sidney S. Bird 4s shares reacted well to the announcement of the annual results, which include an increase by more than a third in the net profit to £121,000 (despite a much larger tax charge); a final dividend

Price Changes in

Company or Board	Nom. Value	Middle price 24th Mar.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	73½	+1	3	3	4 1 9	80	70
Brit. Elec. 1974/77	100	70½	+½	3	3	4 5 0	78½	66
Brit. Elec. 1976/79	100	74½	+½	3½	3½	4 14 0	81½	70
Brit. Elec. 1974/79	100	83½	+½	4½	4½	5 1 9	92½	79½
Overseas Electric Supply								
Calcutta Elec.	£1	15/-	−6d	6†	6·8†	9 1 6†	19/-	15/-
East African Power	£1	18/6	−6d	7	7½	8 2 3	21/-	19/-
Nigerian Elec.	£1	15/6		10	10	12 18 0	18/6	16/6
Perak Hydro-Elec.	£1	14/6		10	12½	17 4 9	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/9		17½	17½	8 2 9	12/-	9/9
Aerialite	1/-	6/9	+1/-	48	51½	7 12 9	6/9	4/9
Allen, W. H.	£1	33/6		10	10	5 19 6	47/3	33/6
Anglo-Portuguese Tel.	£1	20/9		8	8	7 14 3	27/6	20/6
Aron Elec. Ord.	£1	53/9	−3d	15	15	5 11 6	60/-	53/6
Assoc. Elec. Ord.	£1	51/3	+1/3	15	15	5 17 0	73/-	48/9
Automatic Tel. & El.	£1	62/6	+2/-	15	17	5 8 9	75/-	54/6
Babcock & Wilcox	£1	47/9	+2/-	15	13‡	5 8 9	82/6	54/9
Bakelite	10/-	17/6		15	15	8 11 6	24/6	20/9
Baldwin, H. J.	2/-	3/-	−6d	20	20	13 6 9	5/-	3/9
Berry's Electric	5/-	6/3		—	10	8 0 0	6/6	5/6
British Aluminium	£1	47/-	+9d	12	12	5 2 3	71/3	38/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	22/-		22½	25	5 13 9	25/-	17/-
B.I. Callender's	£1	41/9	+1/6	12½	12½	5 19 9	55/-	39/6
B.I. Callender's 6% Pref. ...	£1	20/-		6	6	6 0 0	21/9	19/-
British Tabulating	£1	41/3	+1/3	9	10	4 17 0	56/3	37/6
British Thermostat	5/-	23/9		25	25	5 5 3	27/6	21/3
British Vac. Cleaner	5/-	4/6	−6d	15	10	11 2 3	8/-	5/-
Brook Motors	10/-	36/3		25	25	6 18 0	37/6	30/-
Bulgin, A. F.	1/-	5/6		40	45	8 2 9	5/6	4/-
Burco Dean	5/-	7/9		20	22½	9 13 6*	9/4	5/10
Cable & Wireless: Ord.	5/-	9/3	+1/-	10	10‡*	5 8 0	11/6	8/9
4% Loan	100	94½	+1	4	4	4 4 9	92½	89
Chloride El. Storage "A" ...	£1	59/6	+9d	17½	17½	5 17 9	68/9	55/9
Clarke Chapman	£1	125/-	+5/-	27½	27½	4 8 0	9	5½
Cole, E. K.	5/-	17/6	+1/-	17½	17½	5 0 0	23/6	16/6
Cossor, A. C.	5/-	4/9	+3d	Nil	2½	2 12 9	7/3	5/-
Crabtree	10/-	25/3		20	20	7 18 6	26/-	23/3
Crompton Parkinson Ord. ...	5/-	9/-		16	16	5 18 6*	11/9	9/3
De La Rue	5/-	25/3	+9d	30	35	6 18 6	24/9	16/3
Decca "A"	4/-	25/-	+6d	43½	43½	7 0 0	32/3	22/-
Desoutter	5/-	14/-	+9d	30	18½*	6 14 0	17/9	13/9
Dewhurst	2/-	7/-		16½	20	5 14 3	7/9	5/9
Dictograph Tel.	2/-	5/3		20	20*	7 12 6	6/3	5/3
Dubilier Condenser	1/-	3/3		30	30	—	5/3	3/-
Duport	5/-	8/-		25	25	7 16 3*	10/6	8/6
E.M.I.	10/-	30/9	+6d	15	15	4 17 6	36/-	23/9
Electrical Components	5/-	7/6		25	12½*	8 6 9	8/-	6/6
Elec. Construction	£1	21/3		8½	8½	8 0 0	27/6	21/9
Elliott-Automation	5/-	12/9	−3d	—	10‡	3 18 6	12/6	10/3
Enfield Cable Ord.	£1	11/6		Nil	Nil	Nil	21/6	12/3
English Electric	£1	52/-	+2/3	14	14	5 7 9	65/-	47/6
English Electric 3½% Pref. ...	£1	12/3		3½	3½	6 2 6	14/3	11/3
Ericsson Tel.	5/-	19/6	+1/-	22†	12†*	3 1 6†	25/-	17/-
Ever Ready	5/-	14/6	+3d	35	37½	6 9 3*	20/-	14/-
Falk Stadelmann	£1	37/6		17½	17½	9 6 9	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

making a total of 20 per cent, the same rate as was paid last year before a one-for-four scrip issue; and an additional tax-free 5 per cent payment out of capital profits. On the dividend only, the yield on the shares at 10s becomes 8 per cent. Watford Electric report an expansion of the order of almost 50 per cent in the net profit, after tax, for 1957. The dividend, however, is being kept at the previous level of 25 per cent, on which basis the 2s shares, after rising 9d to 6s 3d, also yield 8 per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 24th Mar.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	31/3	+1/3	14	12½	—	58/9	37/6
G.E.C. 6½% Pref.	£1	20/6		6½	6½	6 6 9	23/6	19/6
General Cables	5/-	11/3		30	24	10 13 3	15/6	11/6
Greenwood & Batley	£1	46/9	−6d	17½	17½	7 9 9	51/3	45/3
Hackbridge Holdings	5/-	8/9		30	20	11 8 6	21/9	11/3
Hackbridge & Hewittic	5/-	11/-		23	20	9 1 9	16/-	10/-
Head Wrightson	5/-	17/3		20	22½	—	24/3	16/6
Heatrae	2/-	4/3		15	15	7 1 3	4/9	4/-
Henley's	10/-	13/-	+9d	11½	11½	8 17 0	17/-	11/-
Holophane	5/-	13/3	+3d	30	37½	8 9 9*	15/9	10/3
Hoover	5/-	35/-		50	50	7 2 9	44/-	24/9
I.C.I.	£1	40/6	+1/9	10	10	4 18 9	46/6	36/3
Intl. Combustion	5/-	24/6		22½	25	5 2 0	30/-	19/3
Johnson & Phillips	£1	16/3		15	10	12 6 3	34/6	18/9
Lancashire Dynamo	£1	32/6	+1/3	11	11	6 15 3	45/9	33/6
Laurence, Scott	5/-	12/9		15	15	5 17 9	19/9	13/9
Lister, R. A.	£1	23/9		10	10	8 8 6	33/9	23/3
London Elec. Wire	£1	42/6	+1/3	12½	12½	5 17 9	53/9	40/9
Lucas, J.	£1	32/6		7½	7½	4 12 3	36/6	27/6
Marconi Marine	£1	32/-		10	10	6 5 0	37/-	30/-
Marryat & Scott	2/-	10/3		30	35	6 16 6	13/-	8/-
Mather & Platt	£1	52/-	+2/-	15	15	5 15 6	63/9	47/-
Metal Industries	£1	27/6		Nil	9	6 11 0	30/-	20/3
Midland Elec. Mfg.	£1	46/3		12½	12½	5 8 0	52/6	45/-
Morphy-Richards	4/-	15/-		50	20*	5 6 9	20/-	11/6
Murex	£1	53/9		20	20	7 8 9	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/11	2/1
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parnall (Yate)	5/-	6/6	+3d	12	12	9 4 6	8/9	5/9
Parsons, C. A.	£1	48/6	+6d	8½	7½*‡	—	71/3	45/-
Plessey	10/-	59/6	+9d	30	30	5 0 9	86/3	60/-
Pye "A" Deferred	5/-	12/-		12½	12½	5 4 3	20/-	12/-
Reyrolle	£1	78/9	+1/3	16½	17½	4 9 0	110/-	72/-
Rheostatic	4/-	6/6		12½	12½	7 13 9	10/-	7/-
Richardsons Westgarth	10/-	14/6	+6d	16½	16½	5 15 0*	20/-	13/6
Scottish Cables	4/-	12/3		27½	27½	8 19 6	19/3	13/3
Simon-Carves	5/-	22/6		28½	20*	4 9 0	36/3	23/9
Smith (England), S.	4/-	8/6		17½	20	4 14 3*	8/-	6/3
Southern Areas	£1	10/-		7½	7½	15 0 0	20/-	11/3
Strand Elec.	5/-	4/9	−6d	15	15	15 15 9	8/-	5/9
Sturtevant	5/-	17/9	−3d	15†	15†	4 4 6†	27/-	17/9
Sun Elec.	£1	47/6		25	25	10 10 6	47/6	42/-
Switchgear & Cowans	5/-	10/6	+3d	25	22½	10 14 3	15/6	9/6
Taylor Tunnicliff	5/-	13/9	+6d	15	17½	6 7 3	13/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	41/3	35/-
T.C. & M.	£1	24/-	+1/-	8½	8½	7 1 9	31/-	23/6
Telephone Mfg.	5/-	4/6		10	10	11 2 3	8/-	5/3
Telephone Rentals	5/-	10/6		12½	12½	5 19 0	12/6	9/6
Thompson (John)	5/-	25/6	+6d	25	25	4 18 0	37/-	23/6
Thorn Elec.	5/-	21/3	+6d	15	17½	4 2 3	26/3	16/3
Thornycroft	£1	23/9	+1/3	12½	12½	10 10 6	37/6	21/3
Tube Investments	£1	53/9	+6d	13½	15	5 11 6	70/-	51/3
Vactric	5/-	14/6		17½	25	8 12 6	23/9	12/9
Veritys	5/-	5/3		12½	12½	11 18 3	9/3	6/9
Walsall Conduits	4/-	11/9		20	20	6 16 3	15/-	11/-
Ward & Goldstone	5/-	24/6	+6d	35	40	4 1 9*	29/-	18/6
Watford	2/-	6/3	+9d	25	25	8 0 0	6/9	5/9
Westinghouse	£1	36/3		18	10*	5 10 3	41/3	28/9
West, Allen	5/-	9/6		15	15	—	13/6	9/6
Wolf Electric	5/-	7/-	−9d	20	10*	7 2 9	13/9	8/9

Pye Capital

An announcement from Pye, Ltd., states that application has been made for an issue of debenture stock. The group's need for new capital, and the belief that this would be met by an issue of ordinary shares, have been affecting the market in the shares since the publication six months ago of the last annual accounts, which showed overdrafts of about £3½ million. The intention then was to replace a part of them by more permanent finance when a suitable opportunity presented itself. Borrowing is stated to have increased recently to £5 million, partly for the purposes of financing larger exports and Government contracts in the fields of guided missiles and atomic energy. A special meeting is to be held on 9th April. Meanwhile no details are given about the size or the terms of the proposed issue.

Switchgear & Cowans

Following the company's decision to maintain the final dividend for 1957 at 15 per cent, as before, Switchgear & Cowans 5s shares improved to 10s 6d. As a result of the earlier reduction in the interim dividend, the total distribution of 22½ per cent is 2½ per cent less than last year's, and the trading profit of £213,000 is down by £10,000; but the outcome is above the expectations which the market framed after the interim report issued last September. This referred to lower trading profits as a result of the engineering strikes and the difficulty of recovering on orders in hand the higher costs arising from increased wages. On the new rate of dividend, which is covered more than one and a half times by the net surplus of earnings, the yield on the shares becomes 10¾ per cent.

Loans and Debentures

The improvement of the gilt-edged market has been reflected in a hardening of prices for first-class company debenture and loan stocks, and has accentuated a shortage in the supply of such issues. Stocks still available in substantial amounts include the Vickers 6 per cent loan stock, redeemable 1977–80, now fully paid up and quoted at about 100; and the new Babcock & Wilcox 6 per cent debenture 1980–83, now £50 paid up with the final call of £47 per cent due by 15th April. It has been on offer lately at an all-in price of 103. English Electric 5½ per cent debenture, 1977–82, has been available at 95, and Anglo-Portuguese Telephone 5 per cent debenture, 1962–67, at 93.

Yugoslav Electrical Trade

Yugoslavia's electrical imports last year were £9·2 million (£6·3 million in 1956) and her exports £4·7 million (£4·4 million). The current export programme envisages an export increase of £0·8 million this year.

REPORTS and DIVIDENDS

Associated Electrical Industries, Ltd.—The report and accounts for 1957, now issued, show a consolidated trading profit of £9,988,476, as compared with £10,307,614, and after providing £5,484,401 (against £5,847,901) for taxation the net balance is £4,504,075 (£4,459,713). To this is added £571,380 set aside for taxation in previous years no longer required, and after deducting £95,762, outside shareholders' interest in net income of subsidiaries, and £1,012,086 retained by subsidiaries, the balance available for appropriation by the holding company is £3,967,607 (against £4,081,715), which with £819,577 brought in, makes £4,787,184 available. General reserve receives £1,000,000 (against £1,250,000) and, as we have already reported, the final ordinary dividend is 7½ per cent, making 15 per cent (unchanged) for the year. The third interim and the final dividends are paid on increased capital. The balance carried forward is £748,571.

In their report the directors state that the value of goods dispatched from factories of the group was £150 million, an increase of 12½ per cent on the previous year, and a substantial part of the total output was exported from the United Kingdom. Orders received by all A.E.I. group companies, both home and overseas, amounted to £177 million (against £138 million in 1956). At the end of the year there were orders in hand to the value of £180 million, compared with £152 million at the end of the previous year. Reference is made to the transfer during the year of the assets of the Edison Swan Electric Co., Ltd., to Siemens Brothers & Co., Ltd., and the changing of the name of Siemens Brothers to Siemens Edison Swan, Ltd. A new company, Siemens Edison Swan (Export), Ltd., was formed as a selling organisation for Siemens Edison Swan products abroad. In addition, the Metropolitan-Vickers Electrical Co., Ltd., purchased the whole share capital of the Fairey Electrical Engineering Co., Ltd., their representatives in the Auckland province of New Zealand for certain types of product.

The report contains an illustrated review of the production expansion during the year. This states that since 1953 the building and equipping of new factories has cost about £10 million a year, and a similar sum has been provided for their operation. The review lists some forty new buildings, new factories or extensions which were completed or under construction during 1957, indicating when each goes into production.

Watsham's, Ltd.—Particulars of this company were published last week in connection with an application for permission to deal and quotation on the Cardiff Stock Exchange for the issued capital of £100,000 in 400,000 5s ordinary units. The company specialises in the erection of overhead electrical transmission lines and the laying of underground cables in the United Kingdom. Work is undertaken for the Central Electricity Generating Board and Government Departments. The profits, before taxation, for the year ended 31st December last were £73,124, and the directors state that the profits of the company and its subsidiary for the current year should not be less than £70,000. On this basis, they would recommend a dividend for the year to 31st March, 1958, of 15 per cent. Contracts have been completed between the various stockholders and the brokers whereby up to 100,000 5s stock units will be available at a price of 8s 3d per stock unit, at which price the yield will be £9 15 9d.

Clarke, Chapman & Co., Ltd.—Speaking at the annual meeting held on 20th March, Mr. J. B. Woodeson (chairman) said that during the year under review they had continued their policy of research and development and had paid particular attention to developing new techniques in both design and manufacture of steam raising equipment associated with nuclear power stations. One of the main factors in this sphere was Class 1 welding and they were building and equipping new shops to deal with these specialised requirements.

On the marine side they were constantly experimenting with new types of control gear for their auxiliary machinery, and had given special consideration to a.c. driven auxiliaries. The new research workshop would be completed in 1958 and it was also proposed to build new laboratories in the near future. In most of the marine departments they had been very busy and the volume of orders for deck auxiliary machinery assured them of a good output for nearly two years.

On the boiler side of their business, the re-adjustment from conventional work to nuclear work was more difficult. There had been a reduction in the demand for structural steelwork and heavy plating and an increase in the requirements for Class 1 tube welding. This change of emphasis would continue and become even more marked. As they re-adjusted themselves to these new techniques it was felt that the profit earnings would, for a period, gradually return to the more normal levels experienced before the peak years occasioned by the demands of the C.E.G.B. for conventional plant, and he felt that this would continue until they had become fully established in the expanding nuclear field. Good progress was being made at the Bradwell site by the Nuclear Power Plant Co. with whom they were associated.

The importance of developing overseas markets coincided with the national need for export progress. For many years they had sold their ships' deck equipment to foreign yards. Their fortunes in this field had fluctuated over the years as home production costs and overseas competition had varied. They were now experiencing a difficult phase in that home production costs continued to rise at the time when Continental competition appeared to be getting keener. Many of their overseas customers who were in the market for power plant were seeking extended terms of payment. Although some assistance was obtainable in facing the risks of such business, British manufacturers were often at a serious disadvantage in competition with American and certain other European suppliers. A considerable fillip to engineering exports could be given by more flexibility and helpful backing from the Government.

Hilger & Watts, Ltd.—The annual meeting was held on 20th March, Mr. G. A. Whipple (chairman and managing director) presiding. In the course of his circulated statement, Mr. Whipple said that the year ended 30th September last again showed that the steady progress of previous years was being maintained and the turnover was a record. He viewed the current year with confidence. The volume of orders received was running at a high level. They had supplied medium spectrographs for both ZETA at Harwell and for Sceptre III at the research laboratories of the A.E.I. During the year a number of new developments came into full production.

Pye, Ltd., has applied for Treasury consent to an issue of debenture stock to finance a funding operation in order to reduce bank overdrafts. To permit of the debenture issue and to give for the future an increased and more flexible limit, it is proposed to raise group borrowing powers to 1½ times the share capital and consolidated reserves. An extraordinary meeting to consider the proposals will be held on 9th April.

The Telegraph Condenser Co., Ltd. A group trading profit of £424,301 is reported for 1957, as compared with £460,026 for the preceding year, to which is added £10,395 interest and dividends. After deducting depreciation, etc., and providing £207,654 for taxation, it is proposed to pay a final dividend of 20 per cent, maintaining the distribution for the year at 25 per cent. General reserve receives £70,000 and £115,518 is carried forward (against £136,945 brought in).

The Watford Electric & Manufacturing Co., Ltd., reports a group trading profit for 1957 of £152,705, as compared with £112,807 for 1956, and after deducting taxation there is a net balance of £73,525 (against £49,304). It is proposed to pay a final dividend of 10 per cent and a bonus of 10 per

cent, making 25 per cent for the year. A similar distribution was made for 1956, but the interim dividend of 5 per cent for that year was paid on capital before a rights issue.

Bulpitts (Swan Brand), Ltd.—This company was registered on 14th March to acquire the whole or any part of the issued share capital of Bulpitt & Son, Ltd., and to carry on the business of an investment holding company.

Underwriting is being arranged by Hart, Son & Co. of an offer for sale of 5s ordinary shares. The offer will consist of 1,570,656 5s shares at 7s each to give a prospective yield of just over £8 18s 7d per cent on a 12½ per cent dividend forecast. The capitalisation will be £1,276,158 6 per cent loan stock, 1970, and £1,374,325 in 5s ordinary shares. It is stated that investments held are more than sufficient to provide for the loan stock interest and repayment, and the whole of the net trading profits, subject to reserves, should be available for dividend.

Franco Signs, Ltd.—The accounts for the year to 30th September last show a group profit of £115,484, as compared with £113,812 for 1956. Taxation absorbs £62,184 and the net profit is £53,300 (against £52,662). The dividend for the year is 13½ per cent (against 12½ per cent). Subsidiaries' reserves receive £25,000 and the balance carried forward is £80,079 (against £73,514 brought in).

Wolf Electric Tools (Holdings), Ltd., reports that after providing £149,004 for taxation, the group profits for 1957 are £126,741 as compared with £151,071 for the preceding year. A sum of £80,000 is placed to general reserves of subsidiaries and it is proposed to pay a dividend for the year of 10 per cent. For the previous year the dividend was 20 per cent, but there has since been a 100 per cent scrip issue.

Bakelite, Ltd.—The accounts for 1957 show group profits amounting to £431,022, as compared with £474,921 for 1956, but after a lower taxation charge of £156,200 (against £214,935) the net balance is higher at £225,472 (£209,986). The ordinary dividend for the year is maintained at 15 per cent with a final payment of 10 per cent.

Sydney S. Bird & Sons, Ltd., report a group profit for 1957 of £121,387, after providing £146,000 for taxation, as compared with £87,804 for 1956. It is proposed to pay a final dividend of 10 per cent, making 20 per cent, less tax, for the year on capital increased by a one-for-four scrip issue, and also to distribute 5 per cent, free of tax, out of capital profits on fixed assets. For 1956 the year's dividend was 20 per cent on the smaller capital.

A. H. Hunt (Capacitors), Ltd.—After providing £105,176 for taxation, the consolidated net profit for 1957 is £89,158, as compared with £83,296 for the preceding year. From this is deducted £2,908 carried forward in the accounts of the United Kingdom subsidiary, and £24,675, provision against loss of the Canadian subsidiary, not consolidated. It is proposed to pay a final dividend of 10 per cent, again making 13¾ per cent for the year. The balance carried forward is £45,551 (against £47,549 brought in).

Switchgear & Cowans, Ltd., shows a consolidated revenue balance for 1957 of £212,669, as compared with £222,520 for the previous year, and after meeting all charges, including £79,100 for taxation, the net balance is £46,754 (against £54,604). General reserve receives £15,000 and it is proposed to pay a final ordinary dividend of 15 per cent, making 22½ per cent for the year. For the previous year the total dividend was 25 per cent, but the interim dividend that year was paid on smaller capital.

Desoutter Brothers (Holdings), Ltd.—The group profits for 1957 amounted to £574,556, as compared with £550,570 for 1956, and after deducting taxation of £301,392, the net profit is £273,164 (against £269, 054), of which £271,231 is attributable to the parent company. General reserve receives £200,000 and it is proposed to pay a final ordinary dividend of 12½ per cent on doubled capital, making 25 per cent for the year. For the previous year the total dividend on the smaller capital was 32½ per cent.

Hopkinsons, Ltd., propose to make a one-for-one scrip issue to ordinary shareholders and an adjustment of preference voting rights. Treasury consent has been obtained to the issue.

Electrical Components, Ltd.—An extraordinary meeting is to be held on 14th April to consider a resolution to change the name of the company to Electrical Components (Holdings), Ltd.

James Howden & Co., Ltd., have declared an interim dividend of 5 per cent (unchanged) on larger capital.

New Companies

Tass Electrical Appliance Distributors, Ltd. Registered 12th March. Capital £100. To acquire the business of selling electrical appliances, apparatus and goods carried on by D. Mason at 33, Ivor Place, N.W.1, as Tass Electrical Appliance Distributors. Directors: D. Mason and Mrs. Vera Mason. Regd. office: 28a, Basinghall Street, E.C.2.

L. D. Burtons Armatures & Transformers, Ltd.—Registered 12th March. Capital £100. Electrical, mechanical and motor engineers, etc. Directors: L. D. Burton and Mrs. Sylvia Burton. Regd. office: Lynn Street, West Hartlepool.

Radio Technicians (Caledonian Road), Ltd.—Registered 5th March. Capital £1,000. Manufacturers of and dealers in and repairers of radio transmitting and receiving sets, etc. Regd. office: 330, Essex Road, N.1.

Low-Voltage Engineering, Ltd.—Registered 6th March. Capital £500. Electrical, mechanical and general engineering consultants, sale representatives, etc. Solicitors: Roger M. W. Pritchard, Bilston.

Ranalar, Ltd.—Registered 6th March. Capital £100. Importers, exporters, manufacturers, representatives and consultants in electronic, electrical and mechanical engineering, etc. Directors: A. B. Clarke and Maureen Clarke. Regd. office: 4, Dovedale Avenue, Kenton, Harrow, Middx.

Tube Replacements, Ltd.—Registered 5th March. Capital £100. Importers, exporters, manufacturers of and dealers in electrical, radio, radar, television and scientific instruments and accessories, etc. Directors: L. Lawton, C. Werter and J. D. C. Henderson. Regd. office: 15, Red Lion Square, W.C.1.

Turbo-Electric, Ltd. — Registered 5th March. Capital £200. General, mechanical, motor, electrical, oil fuel, constructional, marine, civil and consulting engineers, etc. Directors: J. Hope and R. Crowe. Regd. office: 16, King Street, Southport.

Paulin Manufacturing Co., Ltd.—Registered 6th March. Capital £100. Manufacturers of and dealers in electronic equipment, etc. Directors: Paulin Silbermann and Lily Silbermann. Regd. office: 71, Baker Street, W.1.

Liquidations

J. W. Booker & Co. (Radio), Ltd., radio and television dealers and electrical engineers, 96, Killigrew Road, Falmouth.—Liquidator, Mr. E. G. Shearing, 24, Lemon Street, Truro, Cornwall, appointed 28th February, with a committee of inspection.

Willectric Thermall Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. C. Hedges, 4, Charterhouse Square, London, E.C.1.

Bankruptcies

J. Vipond, 6, Taunton Road, Sparkbrook, Birmingham, electrical dealer. — Receiving order made 7th March on a creditor's petition. Public examination 7th May at the Court House, Corporation Street, Birmingham, 4.

T. F. Mathias, Charles Court, Letterston, Pembroke, electrical contractor.—Trustee, Mr. W. H. Peredith, Government Buildings, 10, St. Mary's Square, Swansea, Official Receiver, released 11th March.

O. E. Harford, Mount Charles Road, St. Austell, Cornwall, electrical contractor and dealer.—Last day for receiving proofs for dividend 2nd April. Trustee, Mr. J. W. Shaffery, 4, Tregarne Terrace, St. Austell.

Plastics Prospects

Given reasonable trade conditions, there was no limiting target yet in sight for the expansion of the United Kingdom plastics industry, said Mr. H. V. Potter (Bakelite, Ltd.), president, at the annual meeting of the British Plastics Federation in London last week. New materials and new uses for existing materials were continually being developed. Output last year was estimated at 400,000 tons, an increase of nearly 20 per cent on the figure for 1956, and exports of raw materials in 1957 of 112,000 tons, valued at near £30 million, represented an increase in value of nearly 15 per cent over 1956. The increases had been accomplished by more capital investment and by an increased number employed, but in spite of that, costs had continued to rise. In many cases these had had to be absorbed, owing to strong competition both at home and abroad. Any further increase in costs must be absorbed by increased efficiency, increased production and sales. The industry must try and stabilise prices as far as possible. The Federation was keeping in close touch with European Free Trade Area developments and formed a special sub-committee in April last year.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 2nd April from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

13753. General Electric Co., Ltd., Brown, C. S., and Kell, R. C.—Methods of growing quartz crystals. 12th May, 1954. (792724.)

26036. British Telecommunications Research, Ltd.—Electric signalling systems. 20th July, 1954. (792664.)

1954

8491. General Electric Co., Ltd., Hunt, B. E., and McKeag, A. H.—Luminescent materials. 23rd June, 1955. (792903.)

13864. Standard-Thomson Corporation.—Thermostatic valve. 12th May, 1954. (792771.)

16430. Negromanti, A.—Electric pressing irons. 31st May, 1955. (792772.)

19779. France, H. G. de.—Compatible colour television systems. 6th July, 1954. (792863.)

19951. Sylvania Electric Products, Inc.—Fluorescent lamps, fluorescent lamp coatings, coating suspensions for coating fluorescent lamps and methods of coating fluorescent lamp tubes. 7th July, 1954. (792773.)

20668. Midland Electric Manufacturing Co., Ltd.—Interlocking mechanism for electric switches. 4th October, 1955. (792802.)

29412. Nielsen, H.—Methods and apparatus for scanning by electro-oscillographic means. 12th October, 1954. (792725.)

30442. National Research Development Corporation.—Electronic digital computers. 21st October, 1955. (792707.)

33318. General Electric Co.—Apparatus for picking up articles seriatim from a stack. 17th November, 1954. (792622.)

34039. Lucas (Industries), Ltd., J.—Radio interference suppressors. 14th November, 1955. (792726.)

36045. Bendix Aviation Corporation.—Electronic gas turbine control system. 13th December, 1954. (792661.)

1955

1757. Horizons, Inc.—Electrostatic reproduction. 20th January, 1955. (792708.)

4490. Lehner, C. L. (trading as Fernsprech-und-Signalbau Lehner & Co. Komm.-Ges.).—Electric signalling arrangement. 15th February, 1955. (792670.)

12930. Planer, Ltd., G. V.—Capacitors and electrical capacitive elements. 4th May, 1955. (792835.)

13218. British Thomson-Houston Co., Ltd.—Overload control systems for dynamo-electric machines. 4th May, 1956. (792871.)

13776. British Thomson-Houston Co., Ltd.—Networks for generating pulses of electrical energy. 12th May, 1955. (792641.)

14273. Compagnie Générale de Télégraphie sans Fil.—Millimetre wave generators using reflex klystrons. 17th May, 1955. (792836.)

14900. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 26th April, 1956. (792675.)

16759. Stromberg-Carlson Co.—Electronic switching systems. 10th June, 1955. (792625.)

17170. Triangle Products, Ltd.—Electrodes for spot welders. 10th May, 1956. (792766.)

18026. English Electric Co., Ltd.—Computer storage systems. 22nd June, 1956. (792729.)

18347. Standard Telephones & Cables, Ltd.—Transducer housing. 24th June, 1955. (792597.)

21348. Thorn Electrical Industries, Ltd.—Luminescent materials. 12th July, 1956. (Cognate application 8893, 21st March, 1956.) (792598.)

25284. Standard Telephones & Cables, Ltd.—Travelling-wave tube. 2nd September, 1955. (Addition to 767078.) (792814.)

26175. Western Electric Co., Inc.—Multichannel carrier signal transmission systems. 13th September, 1955. (792815.)

27097. General Electric Co.—Electrical resistance heaters. 22nd September, 1955. (792577.)

29644. Communications Patents, Ltd.—Apparatus for simulating radio navigational aids. 18th October, 1955. (792696.)

32303. Philips Electrical Industries, Ltd.—Devices comprising a polyphase transformer for frequency conversion. 11th November, 1955. (792684.)

33088. Watson & Sons (Electro-Medical), Ltd.—Supporting means for radiographic apparatus. 19th November, 1956. (792877.)

35905. Siemens & Halske Akt.-Ges.—Circuit arrangements including a relay device. 14th December, 1955. (792732.)

36025. General Electric Co.—Optical depth measuring devices. 15th December, 1955. (792686.)

36462. Preh, W., and Preh, A. (trading as Preh, Elektrofeinmechanische Werke, J. Preh Nachf.).—Switch mechanism for electrical tuning devices for wireless receiving apparatus. 20th December, 1955. (792878.)

1956

4596. Western Electric Co.—Electromagnetic relays. 14th February, 1956. (792699.)

10133. Philips Electrical Industries, Ltd.—Manufacture of grids for electric discharge tubes. 3rd April, 1956. (792786.)

12407. Siemens-Schuckertwerke Akt.-Ges.—Apparatus for the excitation of synchronous machines. 23rd April, 1956. (792719.)

15597. General Electric Co.—Method of manufacturing seamless metal tubing. 18th May, 1956. (792589.)

16577. Philips Electrical Industries, Ltd.—Electric snap action switches. 29th May, 1956. (792652.)

17191. General Electric Co.—Laundry apparatus. 4th June, 1956. (792758.)

20006. Standard Telephones & Cables, Ltd.—Apparatus for producing a magnetic field of constant strength. 28th June, 1956. (792654.)

20161. Standard Telephones & Cables, Ltd.—Pulse repetition rate selector. 29th June, 1956. (792700.)

27755. Philips Electrical Industries, Ltd.—Electric lampholders made of insulating material. 11th September, 1956. (792655.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 5th April:—

BL (design). No. 769,404. Class 6. Metal fittings for aerials and for electrical transmission lines. BL (design). No. 769,405 and BELLING-LEE. No. 771,681. Class 8. Thermionic valve extractors and thermionic valve pin straighteners, all being hand tools. BL (design). No. 769,406. BELLING-LEE. No. 771,682. Class 11. Portable electric lamps (being fittings for vehicles) for illuminating or for giving warning light to oncoming traffic. BL (design). No. 769,407. BELLING-LEE. No. 771,683. Class 12. Electrically operated direction indicators for vehicles. BL (design). No. 769,408. BELLING-LEE. No. 771,684. Class 17. Electrical insulators. BL (design). No. 769,409. BELLING-LEE. No. 771,685. Class 19. Screened rooms and screened compartments, all being structures impervious to radiations of radio frequencies.—Belling & Lee, Ltd., Great Cambridge Road, Enfield, Middx.

WINCO. No. 754,762. Class 7. Electric generators, electric motors (not for land vehicles), generators combined with a prime mover; dynamotors; and parts.—Wincharger Corporation, Sioux City, Iowa, U.S.A. Address for service, c/o Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.

ACEC (design). No. 770,172. Class 7. Electric generators, dynamos, motors (not for land vehicles), alternators, pumps, hoisting gear (not for boats), hydraulic turbines, machines for mechanical handling, and dynamos combined with a prime mover. ACEC (design). No. 770,173. Class 9. Electrical and electronic apparatus and instruments, domestic electrical appliances and laboratory apparatus; instruments for measuring and detecting radiation; signalling apparatus, telecommunication apparatus and instruments, dictating machines, sound recording and sound reproducing apparatus; spectrographs, electric resistances, experimental furnaces, batteries, photo-electric cells, oscillographs, insulated electric wire, electric cables, conduit material, sockets, switches, vacuum and gas-filled electronic tubes; tachometers, Geiger counters; and measuring, counting and recording instruments and apparatus, all for use in connection with nuclear reaction processes and with radio-activity. ACEC (design). No. 770,174. Class 10. Electric infra-red heating lamps, mercury vapour lamps and electric ultra-violet lamps, all for surgical or curative purposes; X-ray tubes; and apparatus for giving medical treatment by means of ultrasonotherapy. ACEC (design). No. 770,175. Class 11. Electric heating and electric lighting apparatus; domestic electrical appliances; and furnaces (other than experimental furnaces).—Ateliers de Constructions Electriques de Charleroi, Brussels, Belgium. Address for service, c/o Feeny & Feeny, 22, Buckingham Gate, Westminster, London, S.W.1.

BALBO. No. B769,912. Class 7. Electric arc welding machines.—Balbo Welding Processes, Ltd., 29A, Stanley Road, Teddington, Middx.

MILDTRODE. No. 772,576. Class 9. Electrodes for electric arc welding.—Welding Supplies, Ltd., Beechings Way, Gillingham, Kent.

VERITAS MINI. No. 772,100. Class 11. Heating, lighting and cooking installations and apparatus and parts.—Falk, Stadelmann & Co., Ltd., Veritas House, 91, Farringdon Road, London, E.C.1.

Street Lighting Plans

Brighouse Corporation is applying for permission to borrow £12,045 for the second year's street lighting conversion programme.

Croydon Highways Committee is to consider a list of roads to be included in the third stage of its five-year programme of work for improving the street lighting in the borough. The scheme provides for the installation of 25ft steel columns and 140 W sodium lanterns, at a total estimated cost of £84,000.

Guildford Corporation Works Committee has recommended approval of a preliminary scheme for rearranging the lighting of the by-pass when the dual carriageways are constructed. The cost is expected to be about £10,000.

Hebden Royd U.D.C. has approved a £14,500 scheme for renewing the street lighting along the main Yorkshire and Lancashire road from Whiteley Arches to Upper Foot, Luddenham Foot.

Spenborough Council plans to spend £84,000 on converting all the remaining gas street lighting to sodium lighting during the next ten years.

Stockton-on-Tees Town Council is seeking sanction to borrow £10,079 for street lighting in Norton High Street and Bowesfield Lane.

Wembley Highways and Works Committee has approved in principle a six-year plan for improving the lighting of five miles of main roadway, at an estimated cost of £17,500.

Wavey WASHERS

Beryllium Copper "Wavey" Washers. For Electronic Components. Range 10BA to ¼" B.S.F. Corrosion resisting, non-damaging to components, higher resistance of "set", higher recovery of load, permanent spring action. They are fabricated from Beryllium copper, heat treated to VPN.350 minimum, Electro Plated to DTD.924, Cadmium Plated to DTD.904 and Passivated to DTD.923. Samples and price lists on request.

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SPRINGS, SPRING CLIPS
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London Office: 122 High Holborn, W.C.1 Tel.: Holborn 7470 & 7479

Electronic Rectifiers with single anode mercury vapour bulbs

Up to 75kW for industrial and laboratory use

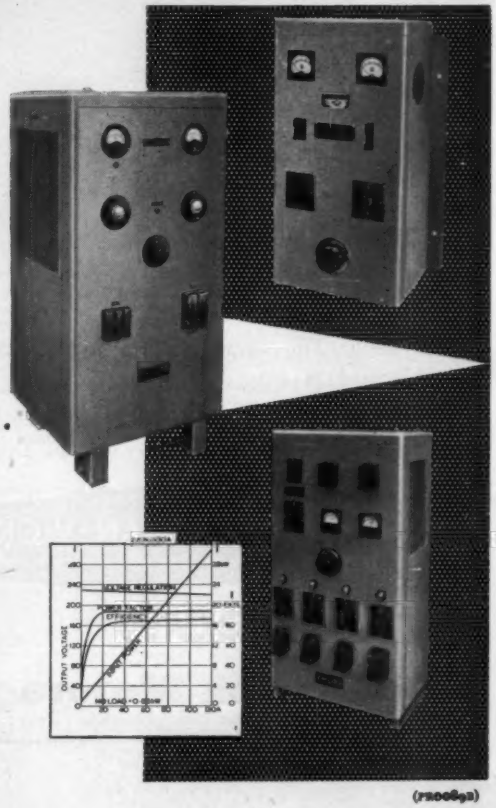
All rectifiers in Philips wide range are noted for:

- *High efficiency and long life with single anode mercury vapour bulbs;*
- *low initial cost;*
- *reliable service with minimum attention, due to absence of moving parts.*

General characteristics of a typical Philips Rectifier can be seen from the graph on right, showing a rectifier designed to operate from 3-phase supply and giving up to 100 amps at 220/230 volts DC.

The curves indicate:
(*a*) Excellent voltage regulation obtained from light load up to overload.
(*b*) Maintenance of high efficiency even at partial load.
(*c*) Small 'no load' loss.
(*d*) High power factor, well maintained at partial loads.

Rectifiers can be constructed to individual requirements or to fit into existing site conditions. If you would like our technicians to visit your premises and advise you without obligation, or if you require further details of our range of rectifiers, please write to address below.



(PSC892)

PHILIPS ELECTRICAL LTD

RESEARCH AND CONTROL INSTRUMENTS DIVISION
CENTURY HOUSE SHAFTESBURY AVENUE LONDON W.C.2

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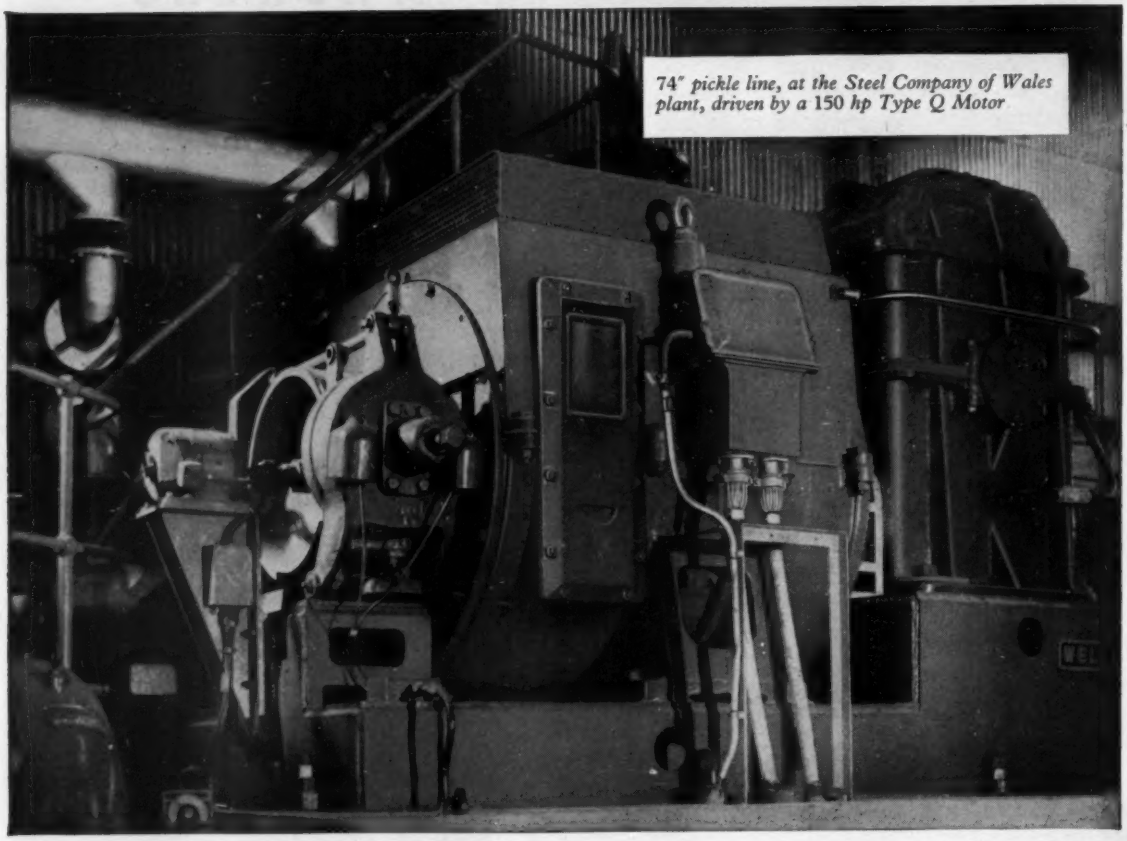
FOR DUSTY ATMOSPHERES



74" pickle line, at the Steel Company of Wales plant, driven by a 150 hp Type Q Motor

Specially designed for operation in dusty or corrosive conditions, the Metrovick Type Q totally-enclosed closed-air-circuit d.c. motor incorporates many improvements which help to simplify maintenance.

- ONE RADIATOR ONLY ON TOP OF THE MACHINE
- RADIATOR EASILY REMOVED AS A COMPLETE UNIT
- ENDBRACKETS CAN BE REMOVED, AND THE ARMATURE WITHDRAWN WITHOUT DISTURBING THE RADIATOR
- CARTRIDGE TYPE BEARING HOUSINGS
- SPLIT BEARING CAP AT THE DRIVING END
- GREASE LUBRICATORS EASILY ACCESSIBLE

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ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

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Metrovick Motors for Trouble-Free Service

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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 31st March

BIRMINGHAM.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Centre. Joint meeting with Supply and Utilisation Group. "Electrical Floor Warming," by J. W. Moule and W. M. Stevenson.

LEEDS.—Leeds University, 7.30 p.m. Incorporated Plant Engineers, West and East Yorkshire Branch. Annual general meeting.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. Annual general meeting. "Colour Television," by L. C. Jesty and E. L. C. White.

LONDON.—Savoy Place, W.C.2. I.E.E. Radio and Telecommunication Section. "Future Radiocommunication Methods for Civil Aircraft," by W. E. Brunt.

NEWCASTLE-ON-TYNE.—Rutherford College of Technology, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Annual general meeting, followed by demonstrations and displays in the laboratories.

Tuesday, 1st April

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "D.C. Winder Drives using Mercury-Arc Rectifier/Invertors," by L. Abram, J. P. McBreen and J. Sherlock.

25, Charlotte Square, 7 p.m. Incorporated Plant Engineers, Edinburgh Branch. "The Development of Diesel Traction on British Railways," by V. Atkinson.

ELTHAM.—Eltham Green School, Queenscroft Road, S.E.9, 7.15 p.m. A.S.E.E. South East London Branch. "Photography in Research and Industry," by P. B. Watt.

HAMMERSMITH. — Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. Film night.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "Economic Aspects of Electrical Engineering," opened by D. J. Bolton.

At the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. "Long Term Planning of Telephone Exchanges," by N. V. Knight and T. J. Morgan.

Northampton College of Advanced Technology, St. John Street, E.C.1. Illuminating Engineering Society. Conference for works managers and works engineers on "Industrial Lighting."

At the Royal Society of Arts, John Adam Street, Adelphi, Strand, W.C.2, 7 p.m. Incorporated Plant Engineers, London Branch. "A Small Generating Station and its Relation to Process Steam Demands," by B. E. A. Vigers.

MANCHESTER.—Engineers' Club, 17, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "The Generation of Electricity in the London Area," by H. V. Pugh.

NEWCASTLE-UPON-TYNE. — Crown Hotel, Clayton Street West, 7.30 p.m. A.S.E.E. Tyneside Branch. "Development of Power Cables," by G. P. Cundall.

OXFORD. — Department of Metallurgy, Oxford University, University Museum, Park Road, 7 p.m. Institute of Metals, Oxford Local Section. Annual general meeting and "At Home."

PETERBOROUGH.—White Lion Hotel, Church Street, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. "Boiler House Management," by O. H. Barker.

YORK.—Royal Station Hotel, 7 p.m. I.E.E. North Midland Centre. "The Control and Instrumentation of a Nuclear Reactor," by A. B. Gillespie.

Wednesday, 2nd April

EDINBURGH.—Y.M.C.A. Social Room, 14, South Saint Andrew Street, 6.15 p.m. I.E.S. Edinburgh Centre. Annual general meeting.

GLASGOW.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "Ship Stabilisation: Automatic Controls Computed and in Practice," by J. Bell.

Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, 8 p.m. A.S.E.E. Glasgow Branch. "Manufacture and Uses of Electric Cables."

HARRINGAY.—"Queen's Head," 677, Green Lanes, N.4, 7.45 p.m. A.S.E.E. North London Branch. "Development and Research of Gas Turbine Engines," by Dr. P. H. Calder.

MANCHESTER. — Engineers' Club, Albert Square, 7 p.m. A.S.E.E. Manchester Branch. Members' lecturettes.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, Corporation Road, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Some Transistor Input Stages for High-Gain Chopper-Type D.C. Amplifiers," by Dr. G. B. B. Chaplin and A. R. Owens.

PORTSMOUTH.—C.E.G.B. offices, 6.30 p.m. I.E.E. Southern Centre. Annual general meeting, followed by "Junction Transistors," by E. Wolfendale.

PRESTON.—R.A.F.A. Club, East View, 7.30 p.m. A.S.E.E. Preston Branch. "Modern Fixing Practice," by R. P. Dunn.

SOUTHAMPTON.—Incorporated Plant Engineers, Southern Branch. Visit to Hamworthy Engineering, Ltd., followed by a lecture on "Automation in the Boiler House."

Thursday, 3rd April

HULL.—Y.E.B., Hull, 6.30 p.m. I.E.E. North Midland Centre. District meeting. "Static Electricity in Industry," by G. Moore.

LONDON. — 17, Belgrave Square, S.W.1, 6.30 p.m. Institute of Metals, London Local Section. Annual general meeting followed by "New Protective Coatings for Metals," by W. E. Ballard.

SOUTHAMPTON.—Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. "Capacitors Pay Dividends."

Catalogues and Lists

AIR CONDITIONING.—Loose-leaf catalogue dealing with the "Far-Air" and "Rotonamic" air cleaning equipment.—**Intermit, Ltd.**, 37, Bradford Street, Birmingham, 5.

Leaflet (557) giving particulars of the Visco "M.V." type dry air filter.—**Visco Engineering Co., Ltd.**, Stafford Road, Croydon, Surrey.

BATTERIES.—Catalogue giving details of "Exide" and "Drydex" batteries for light electrical and electronic applications.—**Chloride Batteries, Ltd.**, Clifton Junction, Swinton, Manchester.

Broadsheet listing the range of "D.P. Kathanode" traction cells manufactured by the company.—**D.P. Battery Co., Ltd.**, Bakewell, Derbyshire.

CONDUIT FITTINGS. — Eight-page booklet giving particulars and prices of the company's range of pressed steel conduit fittings.—**Metway Electrical Industries, Ltd.**, Canning Street, Kemp Town, Brighton, 7.

ELECTRO-HYDRAULIC ACTUATORS.—Illustrated catalogue describing types 340 and 350 electro-hydraulic valve operators.—**Fisher Governor Co., Ltd.**, Airport Works, Maidstone Road, Rochester, Kent.

ELEVATORS.—Series of leaflets describing the company's elevators designed for dealing with sacks and bales, loose potatoes, coal, lime, sugar beet, loose grain, and sand and gravel, etc., and available with single-phase or three-phase electric motor drive.—**Wysall Tractor Co., Ltd.**, Wysall, Notts.

FURNACES.—Two leaflets (P/58 and RH/57) describing the company's roll hearth and pusher type continuous furnaces.—**G.W.B. Furnaces, Ltd.**, Dibdale Works, Dudley, Worcs.

HEALTH LAMPS. — Brochure giving prices, particulars and illustrations of the company's range of infra-red and ultra-violet health lamps.—**Lumsden Lamp Co.**, Millburn, Almondbank, Perth.

INSTRUMENTS.—Five leaflets covering switchboard and panel type moving coil instruments.—**English Electric Co., Ltd.**, Stafford.

INSULATION MATERIALS.—Brochure describing silicone electrical insulation materials produced by the company.—**Micanite & Insulators Co., Ltd.**, Blackhorse Lane, Walthamstow, London, E.17.

LIGHTING FITTINGS.—Leaflet (67) illustrating a range of ceiling fittings and wall brackets for use with silica lamps and a list (68) giving particulars of a new range of lampshades in various materials.—**Knightshades, Ltd.**, Theaklen Drive, St. Leonards-on-Sea, Sussex.

Brochure dealing with post-top refractor lantern fittings for Group "B" roads and a leaflet describing the company's acorn bowl refractor lantern.—**Holophane, Ltd.**, Elverton Street, London, S.W.1.

SWITCHGEAR.—Four leaflets illustrating and describing various types of consumers' electricity control units.—**Mantel Metalworkers, Ltd.**, 121, Gurney Street, London, S.E.17.

TELEPHONE EQUIPMENT.—Booklet (2324) describing the Type No. 5 telephone dial.—**Automatic Telephone & Electric Co., Ltd.**, Strowger Works, Liverpool, 7.

WIRING COMPONENTS. — Illustrated list (WC.5411) dealing with wiring components including cable glands, line taps, cable sockets and brass conduit bushes and locking rings, etc.—**Davis & Timmins, Ltd.**, Billet Road, Walthamstow, London, E.17.

New E.C.G.D. Offices

The Export Credits Guarantee Department has moved its office in the City of London to Marlon House, Mark Lane, London, E.C.3 (telephone: Royal 3491). The city office, which is under the managership of Mr. A. L. MacManus, M.B.E., A.C.I.S., covers the London postal districts, N., E., S.E., W.C. and E.C., and the counties of Norfolk, Suffolk, Cambridge, Hertford, Bedford, Huntingdon, Essex and Kent.

The Nottingham office is moving to new premises at Lloyds Bank Chambers, Old Market Square, Nottingham (telephone: Nottingham 46585), on 25th March. This office, which is under the managership of Mr. T. H. Collinson, covers the counties of Nottingham, Derby, Leicester, Lincoln, Rutland and Northampton.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Metropolitan Water, Sewerage and Drainage Board, Sydney. 13th May. Three electrically driven pumping sets. (E.S.B. 7185/58. Ten/31546.)*

Belgian Congo.—Government General, Leopoldville. 25th April. Dry batteries. (E.S.B. 7397/58. Ten/31566.)*

Brighton.—Corporation Water Department. 3rd May. 11 kV metalclad switchgear at Balsdean pumping station. (See this issue.)

Burma.—Burma Purchase Board, Rangoon. 7th April. 12 V and 10 V batteries. (E.S.B. 7615/58. Ten/31588.)*

Edinburgh.—North of Scotland Hydro-Electric Board. Cabling, electric lighting and small power services for Duchally power station. (See this issue.)

Iraq.—Iraqi State Railways, Baghdad. 9th April. Twin lead-covered wire. (E.S.B. 7471/58. Ten/31568.)*

Government Development Board, Baghdad. 16th June. Steel cored aluminium cable. (E.S.B. 7156/58. Ten/31531.)*

Jordan.—Jordan Jerusalem Electricity Co., Ltd., Jerusalem. 15th April. Electrical equipment, diesel engines, pumps and fire fighting equipment. (E.S.B. 7244/58. Ten/31563.)*

Korea.—Government Office of Supply, Seoul. 9th April. Radio equipment (marine and land based). (E.S.B. 6883/58.I.C.A. Ten/31474.)*

Leeds.—Yorkshire Electricity Board. 30th April. Distribution transformers. (See this issue.)

Philippines.—National Power Corporation. 22nd April. Switchgear, appurtenances, accessories and spares. (E.S.B. 7418/58. Ten/31572.)*

Rhodesia and Nyasaland. — Electricity Supply Commission, Salisbury. 17th April. Lightning arrestors. (E.S.B. 7631/58. Ten/31579.)*

Salford.—City Council. 6th May. Electric lamps and cables for the year ending 30th June, 1959. (See this issue.)

South Africa.—Durban Corporation. 3rd April. Telephone equipment. (E.S.B. 7104/58. Ten/31518.)* 18th April. Street lighting lanterns. (E.S.B. 7106/58. Ten/31525.)*

Union Tender and Supplies Board, Pretoria. 17th April. Insulated cable. (E.S.B. 7078/58. Ten/31505.)*

Wandsworth.—Borough Council. 23rd April. Maintenance of radio-telephone equipment. (See this issue.)

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Bedford.—Extensions to Lynton Works for W. H. Robertson & Co. (£173,000); Richard Costain, Ltd., builders, Westminster Bridge Road, London, S.E.1.

Belfast.—Hospital for women and children at Dundonald (£2,000,000); F. Gibberd, architect to Northern Ireland Hospitals Authority, 8, Percy Street, London, W.1.

Birmingham.—Block of sixteen-storey flats in redevelopment areas, with electrical floor heating, etc.; R. G. Sheppard Fidler, city architect, Civic Centre.

Bournemouth.—Convalescent home, West Cliff Road; National Deposit Friendly Society, 58, Buckingham Palace Road, London, S.W.1.

Brighton.—Secondary school, East Brighton (£180,000), rebuilding Sussex Street Infants' School (£38,500), science block at Brighton, Hove and Sussex Grammar School (£42,000) and first instalment of community centre at Woodingdean; D. J. Howe, borough engineer, 26/30, King's Road.

Bristol.—Exhibition hall, restaurant, shops and offices, Broadmead; Jacey Investments, Ltd., Somerset House, Temple Street, Birmingham, 2.

Broxbourne (Herts).—East Herts College of Education (£294,677); C. H. Aslin, county architect, County Hall, Hertford.

Bushey.—Home for old people, Sparrows Herne site (£65,000); county architect, County Hall, Hertford.

Cambridge.—New buildings for Perse School; Robert Matthew & Johnson-Marshall, architects, 24, Park Square East, Regent's Park, London, N.W.1.

Catterick Camp.—Primary school; F. Shepherd & Son, Ltd., builders, Blue Bridge Lane, York.

Chesterfield.—New administrative block (£100,000) for Plowright Bros., Ltd., Old Brampton Road; Brewill, Son & Nunn, architects, Armitage Chambers, Victoria Street, Nottingham.

Cockermouth.—Workshop block at Dovenby Hall Hospital for Newcastle Hospital Board; N. Edgar, area architect for the Board, 72, Warwick Road, Carlisle.

Coventry.—St. Michael's Primary School, Whitley Common, second instalment of Foxford Secondary School, and third instalment of Central College of Art and Technology (£152,430); city architect, Bull Yard, off Warwick Row.

Crawley.—Factory, Faraday Road; Fry's (London), Ltd., 56, Southwark Street, London, S.E.1.

Dagenham.—Extensions to South East Essex Technical School, Cannington Road (£200,000); H. Conolly, county architect, County Hall, Chelmsford.

Daventry.—Rebuilding police station and courthouse (£66,260); county architect, County Offices, Guildhall Road, Northampton.

Durham.—Houses and flats (33); L. E. Ellis, city engineer.

Eccles.—Office block for L. Gardner & Sons, Ltd., Barton Hall Works; Norwest Construction Co., Ltd., Ruthven Road, Liverpool, 21.

Exeter.—Industrial development at Sidwell; Ashley United Industries, Ltd., Lees Lane, Gosport.

Fraserburgh.—Second instalment of Fraserburgh Academy (£211,860); county architect, County Buildings, Aberdeen.

Grantham.—Extensions and alterations to General Hospital (£145,000); Rudd & Son, Ltd., Wharf Road, Grantham.

Guildford.—Showrooms and offices, Bridge Street; Brownrigg & Turner, architects, 163, High Street.

Harlow.—Court house (£68,000); Wm. Sindall, Ltd., builders, Gloucester Street, Cambridge.

Hastings.—Extensions, Royal East Sussex Hospital; B. Stevens & Partners, architects, 49, Havelock Road.

Hatfield.—Dwellings (151), Oxlease area; Hatfield-Welwyn Development Corporation, Corporation Offices.

Hendon.—Eleven shops with flats over, offices and nine flats, Hale Lane, Edgware; J. N. Aylwin, architect, 17, Soho Square, London, W.1.

Lanchester (Co. Durham).—Pithead baths, Fenhall Drift Mine; N.C.B. Architects' Department, 24, The Side, Newcastle-on-Tyne.

Leicester.—Three-storey block of flats, St. Matthew's redevelopment area (£15,950); city architect.

Leyland.—Houses (71), Wade Hall estate; F. Howe, U.D.C. surveyor, Council Offices, Leyland, Lancs.

Liverpool.—Further instalment of Gateacre comprehensive school (£236,000); city engineer, Municipal Buildings, Dale Street, 2.

Luton.—Maisonnettes (38), Hitchin Road; H. Parfitt & Sons, Ltd., builders, 852, Harrow Road, Wembley.

Bakery, Selbourne Road; C. Hyde & Son, Ltd., 6, Barners Lane.

Newbury.—Printing works and offices, rear of Northbrook Street; G. W. Simpson & Son, Ltd., 45, Northbrook Street.

Newcastle-on-Tyne.—Eight family group houses (£50,000); G. Kenyon, city architect, 18, Cloth Market.

North Acton.—Additional factory; Launder & Co., Ltd., Park Royal Road, N.W.10.

Nottingham.—Four-storey building, Beastmarket Hill, for Barclays Bank, Ltd.; W. R. A. Curtis Green, Son & Lloyd, architects, 5, Pickering Place, London, S.W.1.

Rickmansworth.—Houses (68), Maple Cross estate; U.D.C. surveyor.

Roehampton.—R.C. primary school, Roehampton Lane; W. H. Gaze & Sons, Ltd., builders, 23, High Street, Kingston-on-Thames.

Southwell. — Houses (42), Ollerton; W. Saunders & Partners, architects, 24, Castlegate, Newark.

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Stanley (Co. Durham).—Houses (120) for U.D.C.; direct labour.

Stoke-on-Trent.—Office block, Fenton; National Coal Board Architects' Department, 69, Lower Parliament Street, Nottingham.

Sunderland.—Methodist Church at Fulwell (£50,000); S. W. Milburn & Partners, architects, 9, Esplanade.

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West Lothian.—Primary school at Braehead; J. Calder, county clerk, County Buildings, Linlithgow.

Whittlesey.—Junior school, Drybread Road; Ruddle & Wilkinson, architects, Long Causeway Chambers, Peterborough.

Witney.—R.C. primary school; Booth, Ledeboer & Pinckhead, architects, 9, Blackhall Road, Oxford.

Wokingham.—Houses (190), Southlake Crescent estate; Selleck, Nicholls & Co., Ltd., builders, East Hill, St. Austell.

Wood Green.—Showrooms; F. A. Horner & Co., 472/478, High Road.

Worthing.—Flats (42), The Boulevard; J. W. Stratton, Ltd., 39, Buckingham Avenue, Shoreham.

Writhlington (Somerset).—Mental health occupation centre, Frome Road; R. O. Harris, county architect, Park Street, Taunton.

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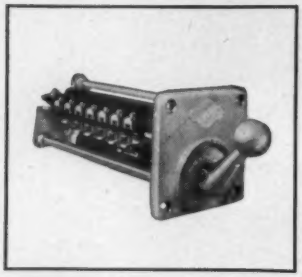

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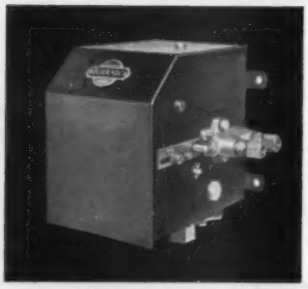

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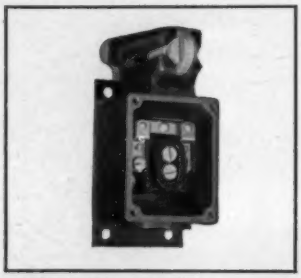

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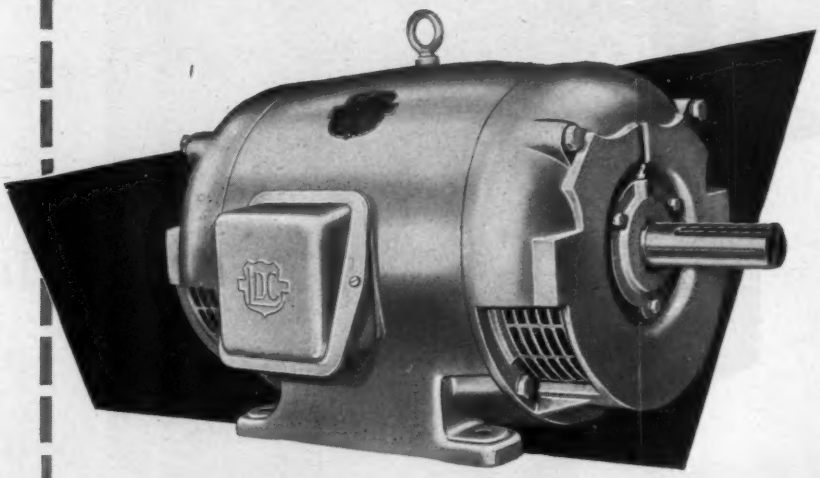

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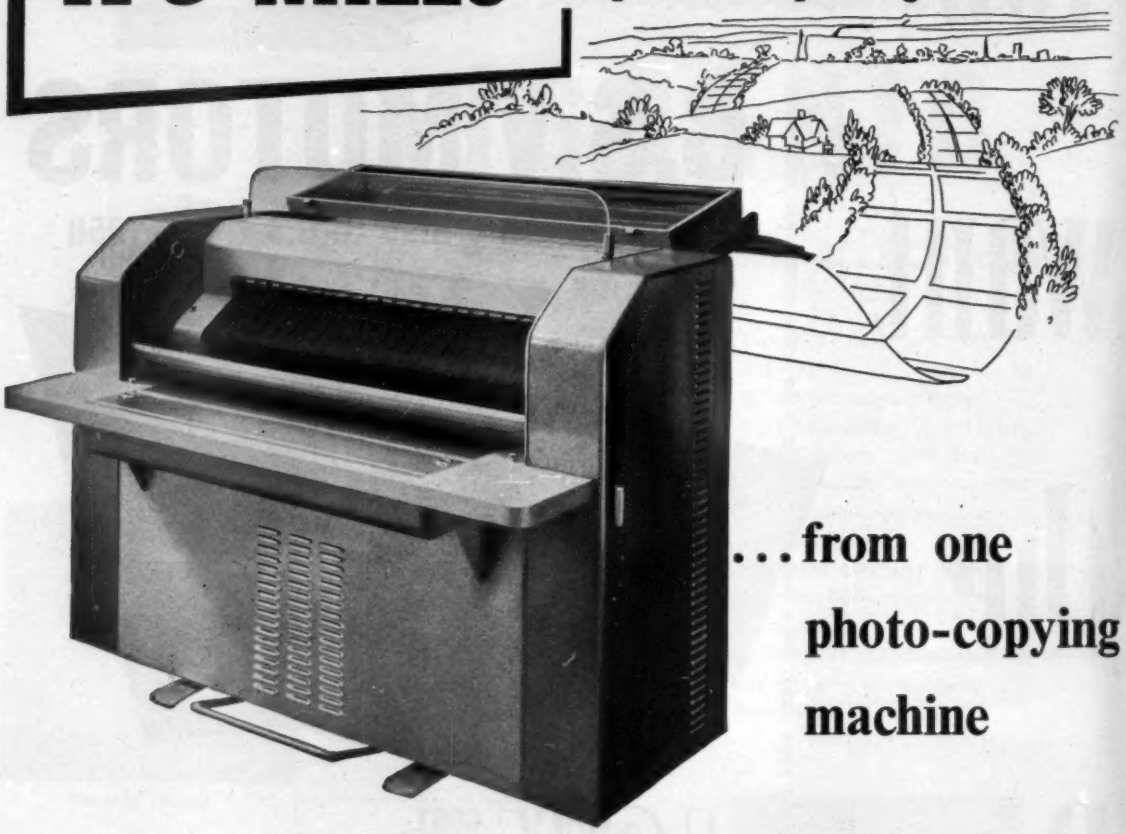

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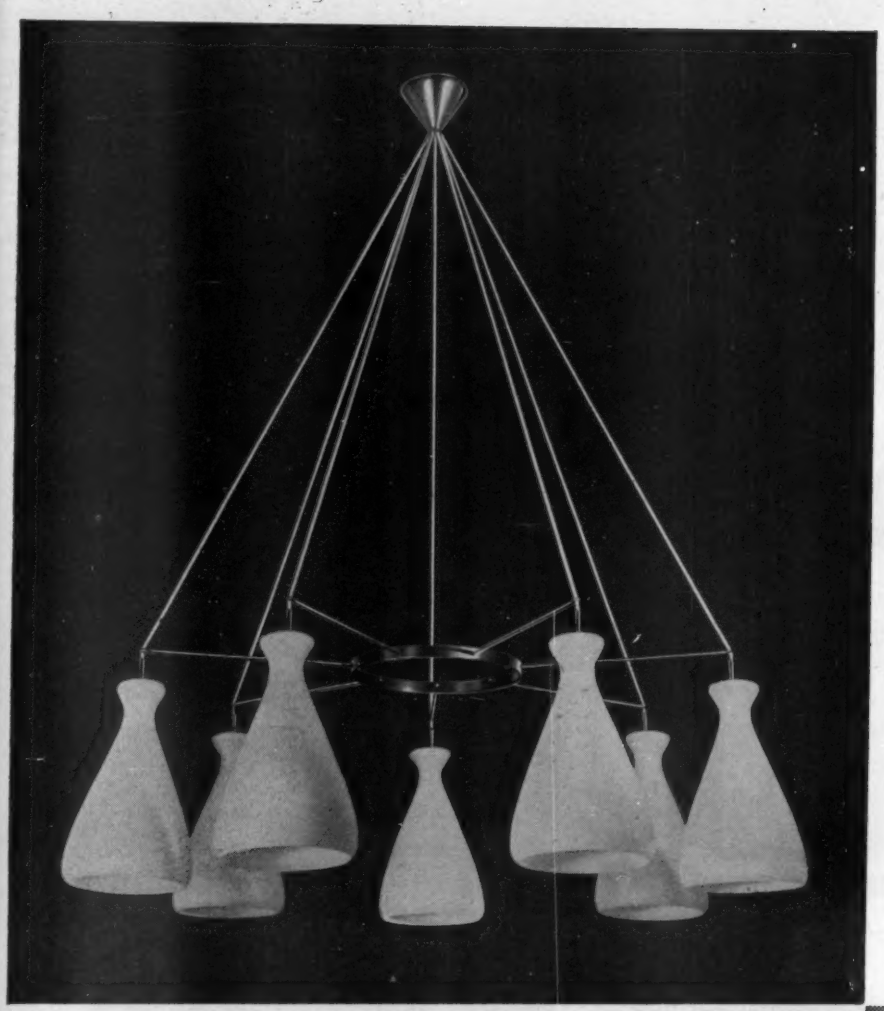

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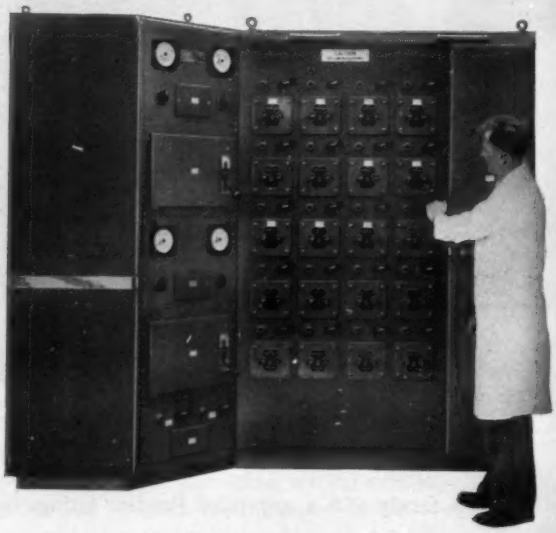

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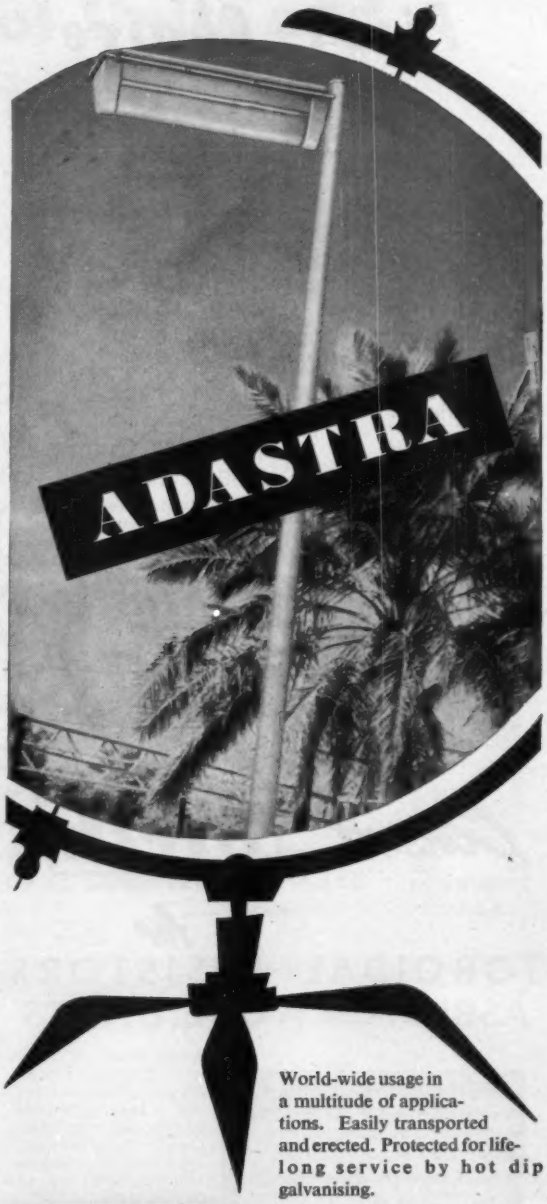

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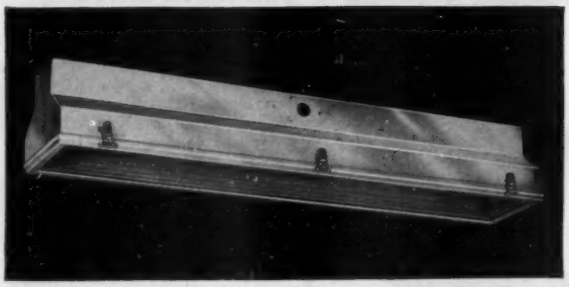

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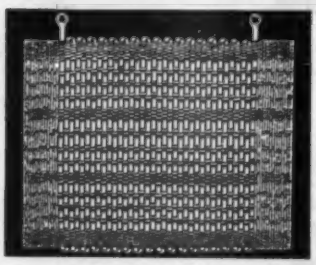

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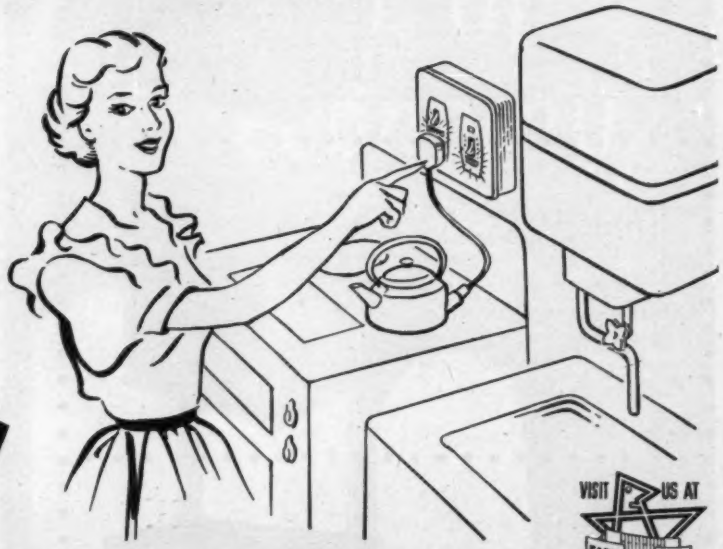

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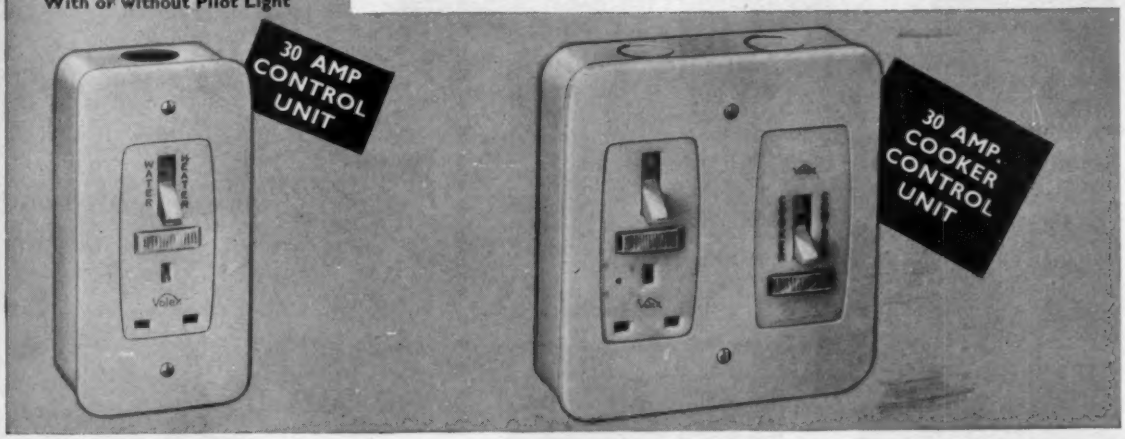

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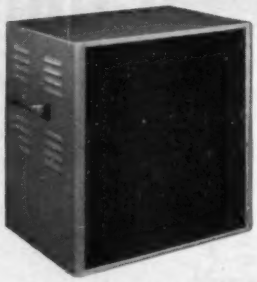

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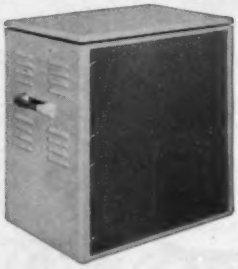

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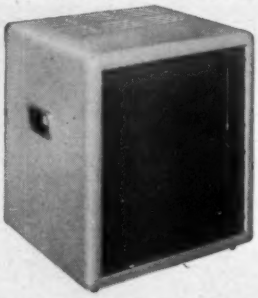

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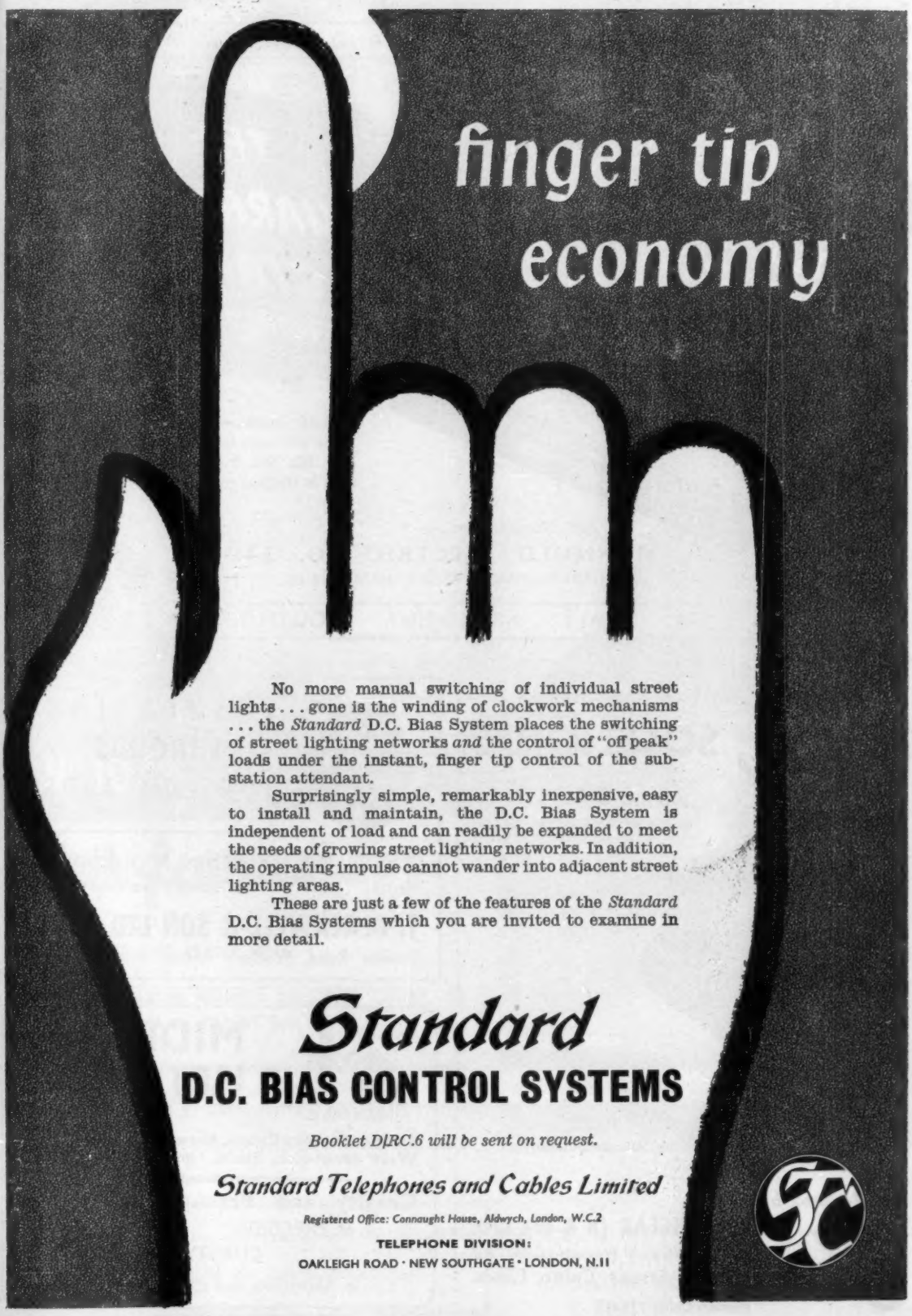

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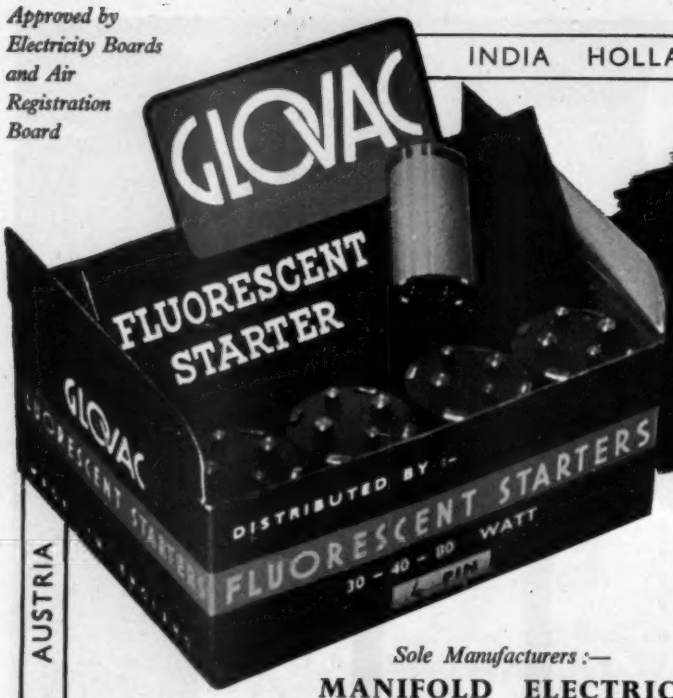

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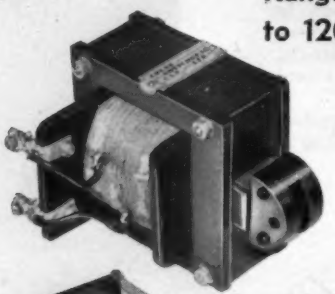

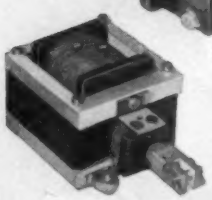

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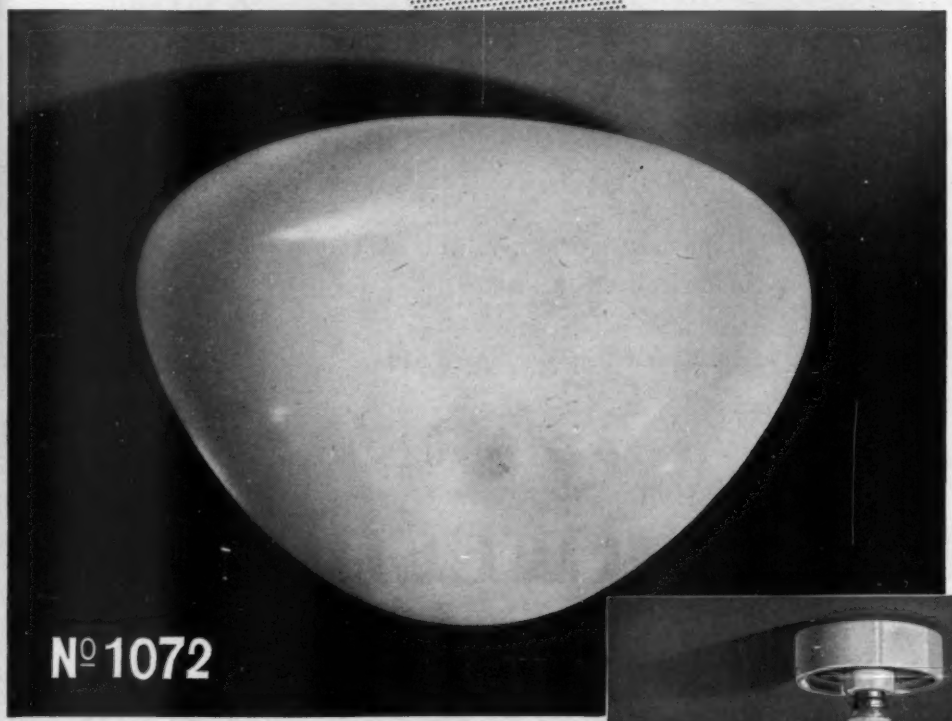

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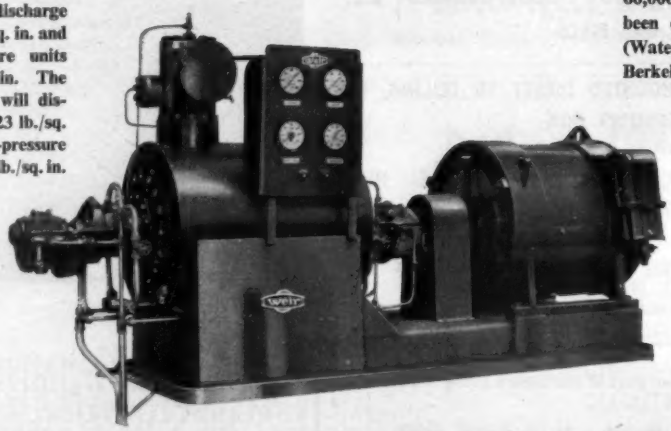
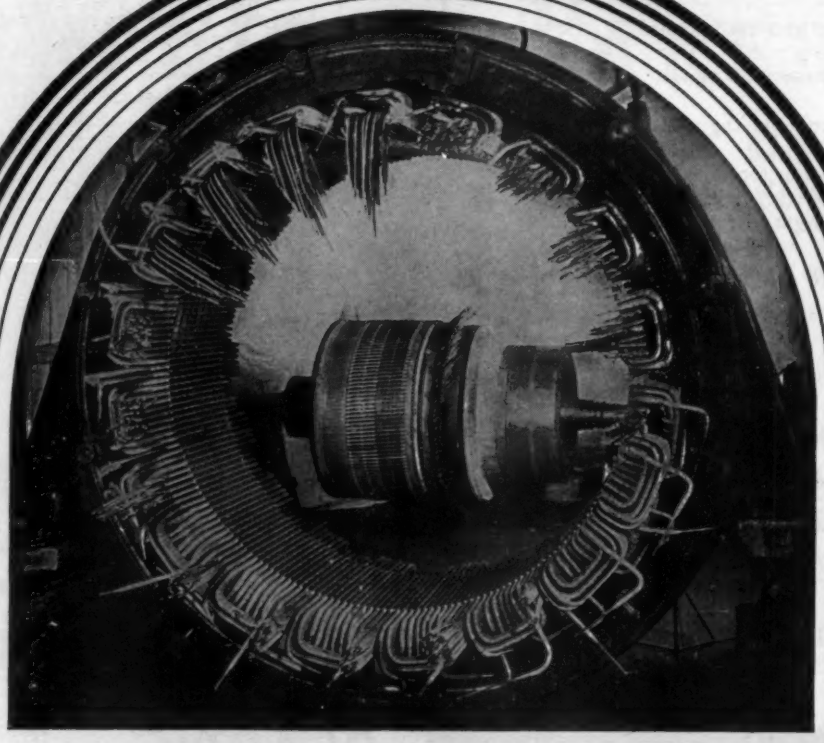


G. & J. WEIR LTD. **CATHCART, GLASGOW, S.4**



Variety. Collins' comprehensive experience ensures there is always at least one interesting job going through their works. Here is the stator of a 1250 H.P., 6,600 V., 246 r.p.m. English Electric Motor undergoing complete rewind. In the background is an Armature from a 250 H.P. B.T.H. C.H.T. variable speed motor.

COLLINS

Collins Electrical Ltd.

Head Office 115 *Clerkenwell Road London E C* 1

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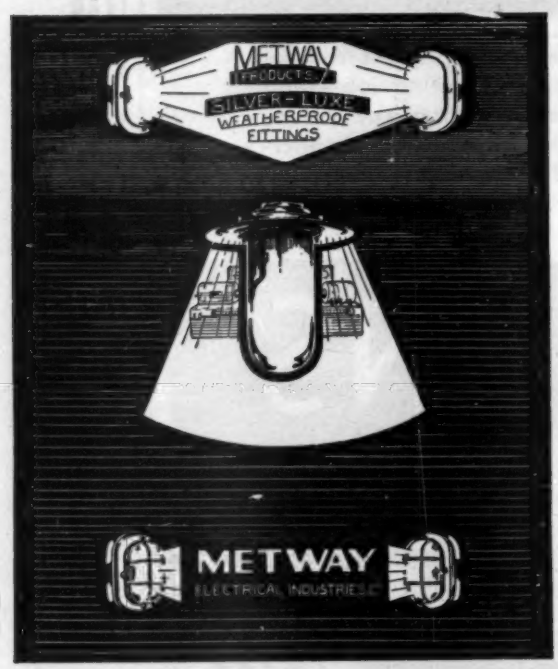

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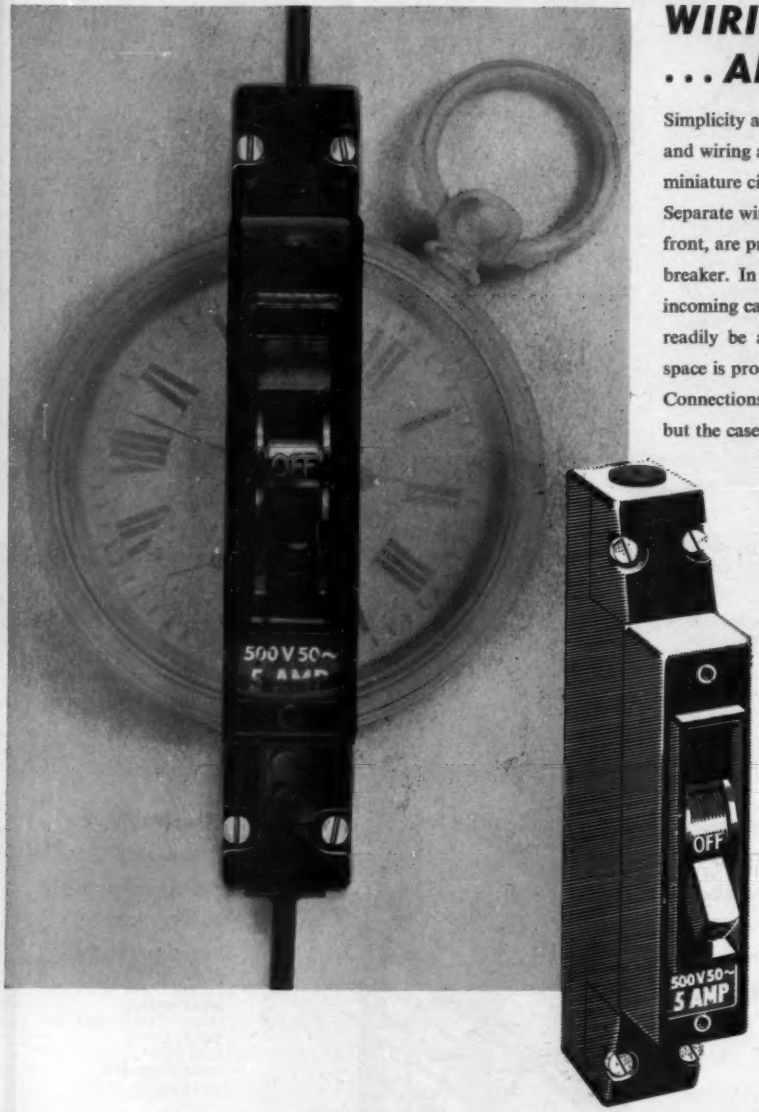

WIRING IS SIMPLE ... AND SPEEDY

Simplicity and speed in erection and wiring are features of Crabtree Type F-60 miniature circuit breakers and distribution boards. Separate wiring chambers, accessible from the front, are provided at the top and bottom of the breaker. In the distribution boards, incoming cables of up to 240 amp. capacity can readily be accommodated and more than adequate space is provided for all outgoing cables. Connections can be made with the breakers *in situ*, but the case can, if necessary, be stripped down in a few minutes. Fuller particulars will be found in Crabtree Publication No. 1191.

WHY THE USER PREFERS CIRCUIT BREAKER PROTECTION

"I can myself identify the faulty circuit and restore the supply without further help"

CRABTREE TYPE F 60

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J. A. CRABTREE & CO. LTD., LINCOLN WORKS, WALSALL, STAFFS

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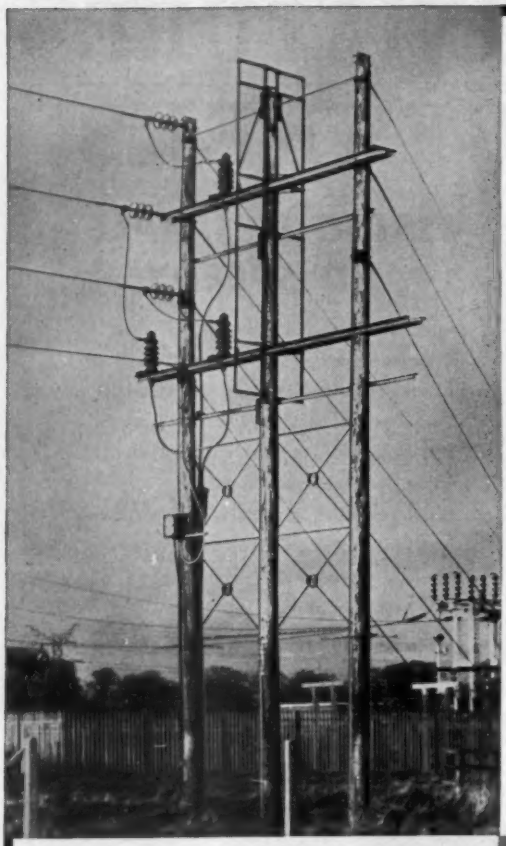

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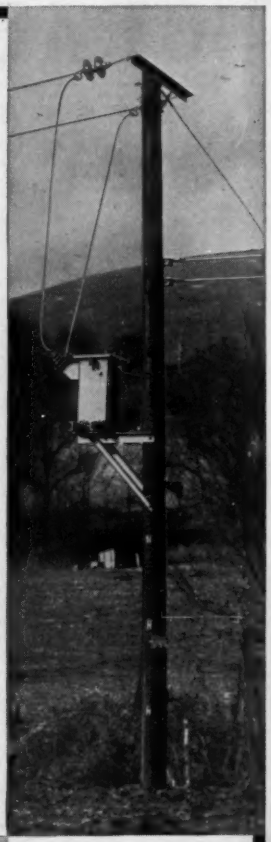
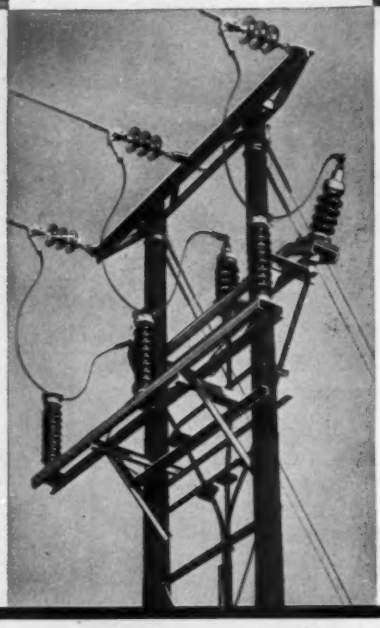


Safe, efficient electrical transmission depends on the reliability and toughness of the galvanised forgings and steelwork that make up Transmission Line Equipment – the all-important items Bayliss, Jones & Bayliss have been manufacturing for over half a century and supplying to Electricity Authorities in all parts of the world.



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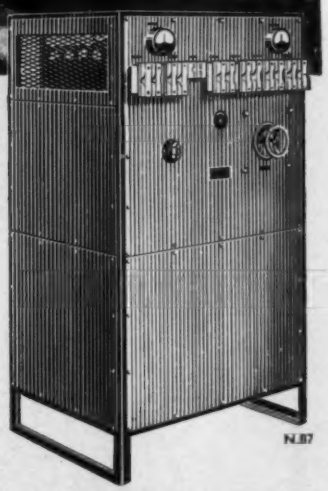

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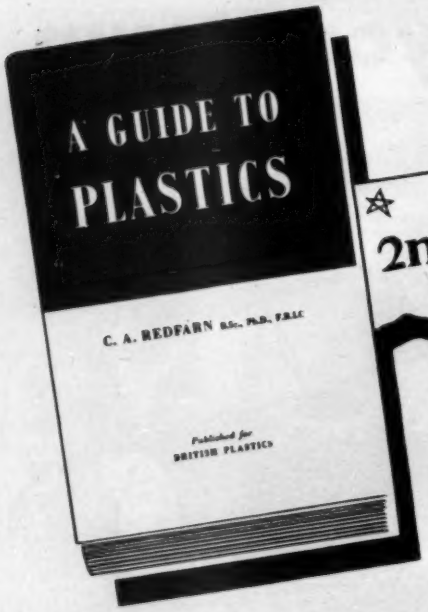

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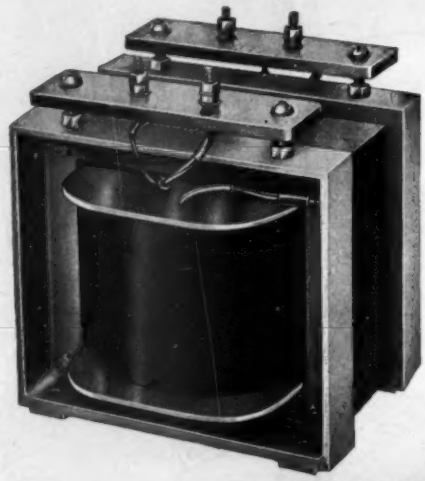

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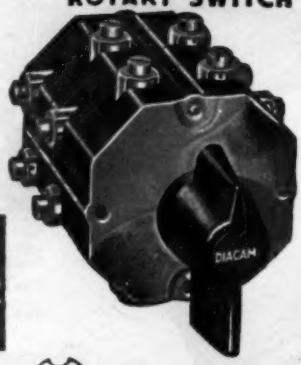
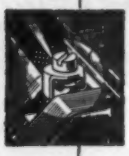


This shows the patent terminal clamp securing two conductors



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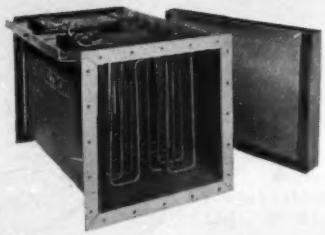

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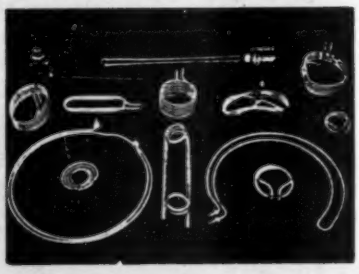

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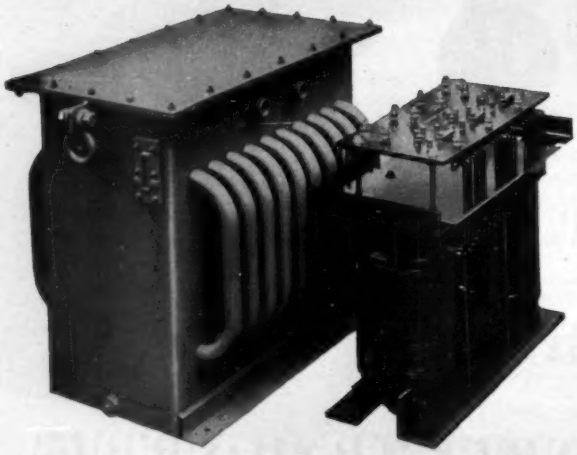

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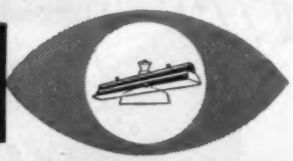

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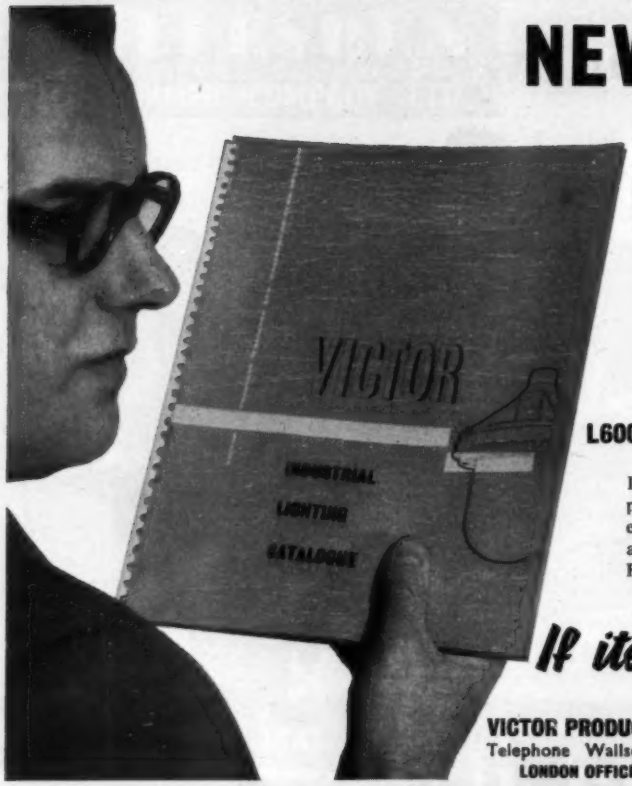

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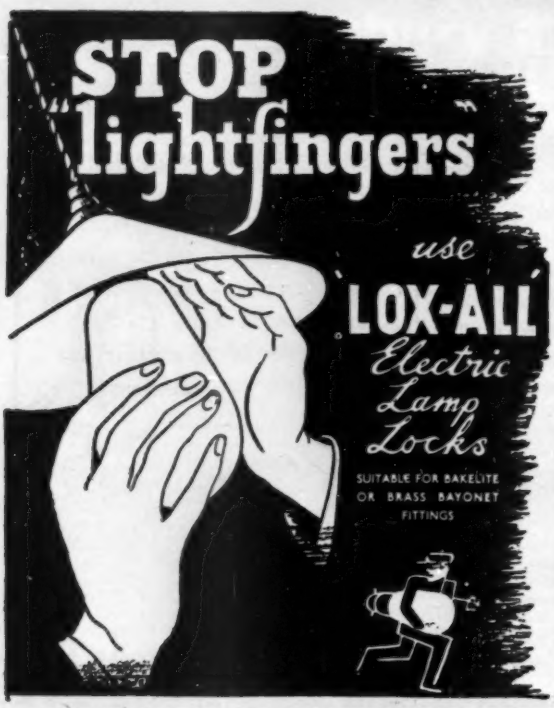

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OFFICIAL NOTICES, TENDERS, ETC.

COUNTY BOROUGH OF BRIGHTON

Water Department

TENDERS invited for the supply, erection, testing and maintenance of 11-kV Metal-clad Switchgear at the Balsdean Pumping Station.

Conditions of contract, form of tender, specification and drawing obtainable from Water Department, 12, Bond Street, Brighton, 1. Deposit of £2 2s. will be refunded on receipt of a bona fide tender and return of documents supplied.

Tenders (in duplicate) enclosed in plain sealed envelope, not bearing any name or mark indicating the sender, and endorsed "Tender for Balsdean Switchgear," to be delivered to me before Saturday, 3rd May, 1958.

The Corporation do not bind themselves to accept the lowest or any tender.

W. O. DODD,
Town Clerk.

Town Hall,
Brighton, 1.
19th March, 1958. 2914

CITY OF SALFORD

TENDERS are invited for the supply and delivery of the following materials during the period 1st July, 1958, to 30th June, 1959:

1. ELECTRIC LAMPS.
2. ELECTRIC CABLES.

Application for forms of tender to be made to the Street Lighting Superintendent, 9, Frederick Road, Pendleton, Salford, 6. Tenders in plain sealed envelopes endorsed "Tenders for Electric Lamps and Cables" respectively must be returned addressed to the Chairman, Purchasing Committee, Town Hall, Salford, 3, not later than 5 p.m. on Tuesday, 6th May, 1958.

The Corporation does not bind itself to accept any or the lowest tender.

R. RIBBLESDALE THORNTON,
Town Clerk.

Town Hall, Salford, 3. 2873

YORKSHIRE ELECTRICITY BOARD

TENDERS are invited for the supply of Distribution Transformers up to 1,000 kVA rating in the following groups:—

Group 1. Pole Mounted Transformers.
Group 2. Substation Transformers
Group 3. Special Substation Transformers.

Annual and long-term contracts will be considered and provision has accordingly been made in the tender documents.

Conditions of contract, specifications, schedules and form of tender can be obtained upon application to the Secretary.

Closing date for receipt of tenders will be noon on Wednesday, 30th April, 1958.

The Board does not bind itself to accept the lowest or any tender.

E. K. RICHMOND,
Secretary.

Wetherby Road,
Scarcroft, Leeds. 2915

METROPOLITAN BOROUGH OF WANDSWORTH

Maintenance of Radio-Telephone Equipment

TENDERS invited for maintenance of one base station and nine mobile radio-telephone equipments.

Tender documents, obtainable from Borough Engineer, must reach me by 10 a.m. on 23rd April, 1958.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
London, S.W.18. 2874

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Shin Project

Cabling, Electric Lighting and Small Power Services for Duchally Power Station

TENDERS are invited for the cabling, electric lighting and small power services at Duchally Power Station, Sutherland.

Tender documents may be obtained from the Engineers, Messrs. Kennedy & Donkin, 12, Caxton Street, London, S.W.1, on receipt of £2 2s. deposit (returnable).

The Board do not bind themselves to accept the lowest or any tender. 2885

SITUATIONS VACANT

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT COMMERCIAL ENGINEER, Woking District.

Applicants should be technically trained and be conversant with the commercial activities of a district. Duties will be initially to assist in the organisation and control of a large voltage standardisation programme.

Qualifications to Higher National Certificate standard. Salary N.J.B. Class F, Grade 10, £740 × £15 to £785 per annum.

Applications, naming two referees, on forms from E. Peel, A.M.I.E.E., Woking Manager, SEEBOARD, 4, Chobham Road, Woking, by 9th April, 1958.

SHOWROOM ASSISTANT/CASHIER (Male or Female), Guildford District.

Annual salary, male £200 to £485 or £565; female £190 to £460 or £565, according to age, educational qualifications and experience. Applicants should have knowledge of electrical appliances and experience in general showroom and cashier duties, and have the ability and initiative to promote sales. The appointment is primarily for the Guildford showroom but the person appointed must be prepared to work in the Cranleigh showroom.

Applications, naming two referees, on forms from W. E. Affleck, M.I.E.E., Guildford Manager, SEEBOARD, 99, High Street, Guildford, Surrey, by 9th April, 1958.

CARTOGRAPHIC DRAUGHTSMAN, Dorking and Epsom District.

Salary within the range £200-£565 per annum. 38-hour week with alternate Saturdays free. Generous leave and sick pay schemes.

Applicants should preferably have experience in the preparation of mains record plans, reproduction of ordnance survey maps and general drawing office routine. Consideration will be given to training a suitable applicant lacking experience.

Applications, naming two referees, to C. L. B. White, District Manager, SEEBOARD, 56, South Street, Dorking, Surrey, by 9th April, 1958.

ASSISTANT (Wayleaves), Croydon and West Kent Sub-Area.

Applicants should have a good personality and a general knowledge of wayleave work. Some experience in overhead line construction an advantage. Salary N.J.C. 2, £615 × £20 to £675 p.a. plus London allowance. Superannuable.

Applications, naming two referees, on forms from T. A. D. Honnor, M.I.E.E., Croydon and West Kent Area Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 9th April, 1958.

G. WRAY,
Deputy Secretary.
2921

EASTER

ADVERTISEMENTS for the issue of 4th April have now closed for press. Advertisements for 11th April are accepted up to **First Post on Thursday, 3rd April,** and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Board Headquarters

SENIOR ASSISTANT (Clerical) (Commercial Department).

Duties will include the keeping of statistical records, compiling information for reports, and technical clerical duties connected with the utilisation development and contracting section. Candidates should have a good working knowledge of technical correspondence.

Salary will be in accordance with N.J.C. Grade 4 (£765/£840 per annum).

Apply, by letter, within fourteen days, stating age, experience, present salary and position to the Secretary (Ref. FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, near Birmingham.

Central Gloucestershire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (Stroud).

Duties involve the construction, maintenance and operation of H.V. and L.V. mains and substations, and planning of system reinforcements and mains extensions. Technical qualifications desirable.

Salary £740/£785 per annum (N.J.B. Grade E.9).

Apply, by letter, within fourteen days, stating age, experience, present position and salary to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Rd., Gloucester.

Shropshire and Herefordshire Sub-Area

ENGINEERING DRAUGHTSMAN (Headquarters).

Applicants should have had a good general and technical education and experience in one or more of the duties involved, which will include preparation of engineering drawings, electrical diagrams, substation site and layout plans. Knowledge of working drawings for substation buildings will be an advantage.

Salary £595/£715 per annum (N.J.B. Schedule D, Grade 6).

Apply, by letter, within fourteen days, stating age, qualifications, experience, present position and salary to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary. 2925

LONDON ELECTRICITY BOARD

Senior Commercial Assistant

APPLICATIONS are invited for the above position in the South Western District at Battersea.

Applicants should have had experience of consumers' service, development, electrical contracting and maintenance, the design of space and water heating installations, and the operation of service centres, etc. Corporate Membership of the Institution of Electrical Engineers would be an advantage.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 6, £1,210 per annum rising to £1,285 per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 8th April, 1958. Please quote ref. PER/2433/R. 2907

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

STATION CHEMIST,
AVON POWER STATION (Warwick)
(Vacancy No. 49/58/ER).

Previous experience in a power station laboratory is essential, and candidates should hold the Higher National Certificate in Chemistry.

Candidates must be familiar with the methods of sampling and analysis of coal, water and oil, and with the interpretation of the analytical results.

Salary will be in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 2nd April, 1958.

ASSISTANT SHIFT CHARGE ENGINEERS,
LINCOLN POWER STATION
(Vacancy No. 50/58/ER).

Applicants should have had a sound technical training and experience in a modern power station, and preference will be given to candidates who possess the Higher National Certificate or its equivalent.

The salary will be in accordance with Class F, Grade 9 (£790-£835 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 9th April, 1958.

ASSISTANT MAINTENANCE ENGINEER (Mechanical),
SPONDON POWER STATION
(Vacancy No. 53/58/ER).

Applicants should have received a sound technical training and wide practical experience in the maintenance of power station mechanical plant, particularly turbo-alternators, and must be capable of planning and supervising mechanical plant maintenance.

Preference will be given to candidates who are corporate members of an appropriate professional institution or hold qualifications leading to such membership.

The salary will be in accordance with Class H, Grade 9 (£885-£930 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 9th April, 1958.

SHIFT CONTROL ENGINEER,
WILLINGTON "A" POWER STATION
(Vacancy No. 54/58/ER).

Applicants should have had a good general education and technical training with practical experience in the control and operation of large modern switchgear. Preference will be given to candidates who possess technical qualifications to Higher National standard.

The salary will be in accordance with Class K, Grade 10 (£935-£995 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 9th April, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

19th March, 1958. 2889

TRANSFORMER ENGINEER

A WELL-known company will shortly have a vacancy for a CHIEF TRANSFORMER ENGINEER.

This is an important appointment, with considerable scope, and with excellent prospects for the right man, and carries a salary appropriate to the responsibility involved.

All applications will be in strict confidence. Existing staff has been informed.

Reply to—Box 2765.

CENTRAL ELECTRICITY GENERATING BOARD

Chief Nuclear Health and Safety Officer

THE CENTRAL ELECTRICITY GENERATING BOARD already have in hand the erection of three Nuclear Generating Stations, scheduled for completion in 1960/62, and thereafter plan to complete six additional Nuclear Stations in the succeeding five years.

The health and safety of the workers and everyone living in the vicinity of the stations will be a matter of paramount importance, and the Generating Board are planning to build up a small team of Scientists and Doctors who will be charged with the responsibilities of seeing that the health and safety organisation in the power stations is adequate, of giving these organisations functional guidance, and of seeing that operating manuals are prepared and followed.

The Generating Board, therefore, invite applications for the appointment of CHIEF NUCLEAR HEALTH AND SAFETY OFFICER.

Applicants should originally have been trained as physicists, physical chemists or in medicine, and must have experience of industrial management, including experience of control of hazard in operations which involve potential danger.

The salary for the appointment will be within the range of £4,000 to £5,000 per annum, depending upon qualifications and experience.

Applications should be forwarded under confidential cover to the Deputy Chairman, Central Electricity Generating Board, Bankside House, Sumner Street, London, S.E.1, in order to reach this address not later than 14th April, 1958, and the envelope should be clearly marked "Chief Nuclear Health and Safety Officer," quoting ER/89A. 2903

SALES ENGINEERS

are required by old-established electric motor manufacturers for the following areas:—

i London and Home Counties.
ii West of England and South Wales.

These are new appointments arising out of expansion of the company's outside sales staff and provide scope for men who are keen to sell first-class products.

Candidates should have good knowledge of electric motors and generators and their applications, and should preferably hold a Higher National Certificate or equivalent qualification.

Salaries in accordance with experience and qualifications. The appointments will include entrance to the company's pension scheme.

Please write, giving full particulars including education and technical training to:—

Personnel Manager, Small Electric Motors Ltd., Beckenham, Kent.

2938

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

FOURTH ASSISTANT ENGINEER is required in the System Development Section of the Technical Department at Headquarters, Moseley, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 7, commencing at a point commensurate with qualifications and experience within the range £810-£935 per annum, ultimately rising to £1,035 per annum.

Applicants should have had experience either in the supply industry or with a switchgear manufacturer, and a knowledge of the calculations involved in the development and operation of power systems will be an advantage. Technical qualifications up to Graduate I.E.E. standard are desirable.

Apply, quoting the vacancy number 768MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 14th April, 1958. 2923

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Maintenance and Operation)

Melksham District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade 10 £740 × £15 to £785 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist principally in the operation and maintenance of H.V. and L.V. underground systems, substation plant, etc., working at voltages up to 33,000 and to undertake minor mains construction. His duties will be primarily in connection with the maintenance and operation under contract of a privately owned distribution system and will include the supervision of shift workers. Qualifications required are an approved technical training and experience of similar work, including fault location.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him, in envelopes suitably endorsed, not later than 9th April, 1958.

General Assistant Engineer

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class G, Grade 12 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

The duties of the post will be to assist in the preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground H.V. and L.V. networks.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, in envelopes suitably endorsed, not later than 9th April, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 2930

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

FOURTH ASSISTANT ENGINEER in the Bristol Region of the Technical Department, based at Divisional Headquarters, Bristol.

Superannuation scheme. Salary N.J.B. Class AX/DX, Grade 8, £710-£835/£910.

Applicants should hold the H.N.C. or other qualifications leading to A.M.I.E.E.

An interest in electrical testing is essential and some knowledge of protective gear and switchgear is desirable. Experience with a leading electrical manufacturer would be an advantage.

Closing date 3rd April, 1958.

SHIFT CHARGE ENGINEER at Castle Meads Power Station, Gloucester.

Superannuation scheme. Salary N.J.B. Class E, Grade 7, £835 × £15 to £880 plus 10% shift allowance.

Applicants should have had considerable experience in modern power station operation. Graduate or corporate membership of a recognised engineering institution or equivalent is desirable.

Closing date 8th April, 1958.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by the date stated. 2924

WORKS ENGINEER

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

A VERY experienced WORKS ENGINEER is required, to be responsible for the Mechanical, Electrical and Building Departments of the Engineering Division. The post covers the operation and maintenance of all supply services ; building maintenance and conversions ; erection and maintenance of orthodox and experimental plant.

The Works Engineer must have first-class professional knowledge of both mechanical and electrical engineering, preferably to honours degree standard. His departments provide essential services for advanced scientific projects (e.g., ZETA), often working to exacting target dates. Good practical experience of negotiating and directing work of contract labour is essential.

Salary £2,100 - £2,600.

Write to the Group Recruitment Officer (1112/48), A.E.R.E., Harwell, Didcot, Berks, for application form and full details. 2863

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

SHEFFIELD SOUTH DISTRICT.

SECOND ASSISTANT DISTRICT ENGINEER. Applicants must have technical qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers, with training and experience fitting them to take charge of one of the operational units in the district.

Salary N.J.B. Class H, Grade 7, £995/£20/£1,055 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 11th April, 1958.

No. 7 (Grimsby) Sub-Area

GRIMSBY DISTRICT.

SALES REPRESENTATIVE. The successful applicant will be required to give advice within the well-defined instructions and under close supervision, on supply matters, tariffs and apparatus sales to consumers with domestic or small commercial or industrial installations.

Salary N.J.C. Grade 1, £500/£20/£600 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 11th April, 1958. 2916

BRITISH INSULATED CALLENDER'S CABLES LIMITED

have vacancies in their

POWER CABLES DIVISION

at BELVEDERE, KENT

for Graduate

ELECTRICAL ENGINEERS
OR PHYSICISTS.

Men with initiative are required

(a) for problems associated with design of cable accessories and concerned with electrical field plotting.

(b) for problems associated with the design of high-voltage cables.

(c) for the testing of very high voltage cables and accessories, involving the operation of extremely high voltage impulse and alternating current testing equipment.

Appropriate salaries and prospects in each case. Applications to the Erith Works Staff Officer.

2906

JOSEPH LUCAS

(ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

TEST ENGINEERS

INTERESTING work in an expanding organisation is available for those interested in electrical testing and design at the E.D.A. Testing House, Leatherhead, Surrey. In these modern laboratories, amid pleasant surroundings, domestic appliances, agricultural and light industrial equipment are tested for the Electricity Boards and the British Standards Institution. Canteen facilities are available and there is a pension scheme. At present vacancies exist in the following grades :—

TEST ENGINEER GRADE II. For those with previous experience in an electrical testing laboratory and who have the Higher National Certificate in Electrical Engineering or Physics. Commencing salary not less than £810 (according to age and experience) rising by £25 p.a. to £935 p.a.

TEST ENGINEER GRADE III. For those with previous experience in an electrical testing laboratory and with knowledge of the design of domestic electrical appliances. Commencing salary not less than £710 rising by £25 p.a. to £835 p.a.

ASSISTANT TEST ENGINEER. For those with a minimum qualification of National Certificate in Electrical Engineering or Physics. Salary £550 × £16 to £625 per annum.

Apply in writing to the Director and Secretary, British Electrical Development Association, 2, Savoy Hill, London, W.C.2. 2886

UGANDA ELECTRICITY BOARD

Appointment of Assistant Power Station Superintendent

APPLICATIONS are invited for the appointment of ASSISTANT POWER STATION SUPERINTENDENT on the permanent staff of the Board at the Owen Falls hydro-electric station on the River Nile at Jinja, Uganda.

Applicants should have had a good education and sound technical training with subsequent experience in the operation and control of a generating station and H.V. transmission system.

Corporate Membership of the Institution of Electrical Engineers or Institution of Mechanical Engineers will be an additional recommendation.

Salary according to age and experience within the scale £1,600 × £40 to £1,760.

Uganda has a pleasant climate and income tax is moderate. Free passages, partly furnished accommodation, medical and dental treatment. Five days' leave for every completed month of service in East Africa. Normal tour 24 to 36 months.

Applications must be submitted on forms available from the London Representative, Uganda Electricity Board, 27, Regent Street, London, S.W.1, who will also supply further information. Completed forms should be returned to him not later than 14th April, 1958.

E. H. WILSON,
Secretary. 2862

FEDERAL POWER BOARD

Operations Controller

THE Board require the services of an OPERATIONS CONTROLLER who should be a fully qualified electrical engineer with wide knowledge of all aspects of the operation of electricity supply systems, including the commercial aspects, and who should possess executive experience. The Board are at present constructing at the Kariba Gorge on the Zambezi a large dam and power station having an initial capacity of 600 MW and an ultimate capacity of at least 1,200 MW.

The Board are also constructing about 930 miles of 330-kV transmission line to connect the Kariba power station with a number of thermal stations in the Federation. The Operations Controller is required in connection with the operation of this integrated system.

Salary up to £4,000 per annum according to qualifications. There is a pension scheme which the successful applicant will be required to join.

Applications should be posted so as to reach the Secretary, Federal Power Board, Reliance House, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 19th May, 1958. 2859

UGANDA ELECTRICITY BOARD

THE Board requires for its permanent staff ASSISTANT ELECTRICAL ENGINEERS with ability and initiative. Work on transmission and distribution is increasing and a further rapid expansion of this work is in hand.

Experience in the construction, operation and maintenance of an electricity supply network, including overhead lines and substations, with voltages up to at least 33 kV is essential. Experience at higher voltage is desirable.

Applicants should either be Corporate or Graduate Members of the Institution of Electrical Engineers or should have technical qualifications leading to that status. Salaries according to age and experience will be within the range £1,045 to £1,440 per annum.

Uganda has a pleasant climate and income tax is moderate. Free passages, partly furnished accommodation, medical and dental treatment. Five days' leave for every completed month of service in East Africa. Normal tour 24 to 36 months.

Applications must be submitted on forms available from the London Representative, Uganda Electricity Board, 27, Regent Street, London, S.W.1, who will also supply further information. Completed forms should be returned to him not later than 14th April, 1958.

E. H. WILSON,
Secretary. 2861

CHIEF ELECTRICAL DESIGNER

CROMPTON PARKINSON
(DONCASTER) LTD.

invite applications for the post of CHIEF ELECTRICAL DESIGNER for F.H.P. motors.

The company want a man with initiative and imagination, having a degree or a good Higher National Diploma or Certificate with endorsements for membership of the I.E.E.

The work will consist mainly of the electrical design of new ranges of A.C. and D.C. motors, and practical experience in this field is essential.

A generous salary is offered, commensurate with the post advertised and the qualifications and experience of the successful candidate.

Conditions of employment are excellent; the company operates a superannuation scheme, and financial assistance towards removal and housing will be considered in appropriate cases.

Write in confidence to Personnel Officer, Crompton Parkinson (Doncaster) Ltd., Wheatley, Doncaster, giving full details.

2893

ROYAL NAVAL SCIENTIFIC SERVICE

PHYSICISTS, ELECTRONIC ENGINEERS and MATHEMATICIANS required for 25 Senior Scientific and Scientific Officer posts at establishments in London area, Baldock, Harwell, Haslemere, Poole, Greenock and Rosyth. Also MECHANICAL ENGINEER for work on heat transfer problems at Harwell. MECHANICAL ENGINEER for work on fuel and lubricating oil problems in London area. MECHANICAL ENGINEER for work on gas turbine problems in London area. CHEMICAL ENGINEERS for London area and Poole. METALLURGISTS for Rosyth and Poole. CHEMISTS (physical and inorganic) for Poole and Baldock.

Candidates must normally be natural-born British subjects of natural-born British parents, with at least First or Second Class Honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be 26 years of age.

Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments are unestablished (with F.S.S.U. benefits), but opportunities may occur for those under 32 to compete for established posts.

Forms from M.L.N.S., Technical & Scientific Register (K), 26, King Street, London, S.W.1, quoting A.98/8A. 2807

Situations Vacant (continued)

MECHANICAL AND ELECTRICAL ENGINEERS IN GOVERNMENT DEPARTMENTS

PENSIONABLE posts for men and women under 35 on 1st March, 1958, with extension for regular Forces service, Overseas Civil Service, established civil service or temporary service as mechanical or electrical engineers in Government Department.

Applicants must either have (or obtain in 1958) Degree in Engineering or Physics (or Diploma of Technology for some posts), or have passed examinations necessary for a professional qualification (e.g., A.M.I.Mech.E., A.M.I.E.E., A.F.R.Ae.Soc., etc.). Exceptionally, evidence of high professional attainment acceptable in place of qualifications. Practical training and experience normally required, but untrained graduates acceptable for some posts.

Men's starting salary from £755 (lower if under 25) to £1,085. Maximum (London) £1,250. Promotion prospects to posts on maxima (London) of £1,720 and £2,050.

Write Civil Service Commission, 30, Old Burlington Street, London, W.1, for application form, quoting No. S.85/58. Closing date 15th April, 1958. Earlier applicants may be interviewed before that date. 2905

TEST ENGINEER

A VACANCY exists for a TEST ENGINEER on the staff of one of the leading electrical manufacturers in the country. The post carries responsibility for the design, layout and commissioning of a wide range of test equipment, mainly for heavy electrical plant.

It is desirable that applicants should have served an electrical engineering apprenticeship with test experience, and possess technical qualifications to at least Higher National Certificate standard.

There are also a limited number of vacancies for skilled Electrical and Mechanical Testers.

Apply, giving full particulars, to :—

The Employment Office
BRITISH THOMSON-HOUSTON CO. LTD.
Rugby, Warwickshire
2894

LONDON ELECTRICITY BOARD

Assistant Chief Commercial Officer (Consumer Service)

APPLICATIONS are invited for the above appointment at 46, New Broad Street, London, E.C.2.

Candidates should be Corporate Members of the Institution of Electrical Engineers and should have wide experience in the organisation and control of electrical appliance maintenance workshops, service on consumers' premises and electrical installation work, including the application of industrial process heating and the design of thermal storage installations.

The appointment will be made in Grade 6, Class C of the National Joint Managerial Agreement, the salary being within the range £2,160-£2,360 per annum, inclusive of the London Area allowance.

Applications, stating age, qualifications, experience and present position and salary, should be forwarded to the Secretary, London Electricity Board, 46, New Broad Street, London, E.C.2, by 11th April, 1958, quoting Vacancy No. V/2453/R. 2917

REPRESENTATIVE

with a knowledge of selling electric cookers and fires required for the YORKSHIRE area.

Applicants, who should preferably not be over 40, should have a good personality and education, be a car owner and have sound contacts with the area board, electrical wholesalers and retailers in the area.

Write giving age, qualifications and experience to:—

BELLING & CO. LTD.,
Bridge Works, Enfield, Middx. 2927

NORTHAMPTON COLLEGE OF ADVANCED TECHNOLOGY, LONDON

APPLICATIONS are invited, especially from those in industry, for the following additional appointments of LECTURERS and ASSISTANT LECTURERS in the Department of Electrical Engineering, for the subjects of :—

(a) Electrical Instruments.
(b) Telecommunications.
(c) Applied Electronics.
(d) General Electrical Engineering.

The work of the department is concerned with Degree and Sandwich Diploma (Dip.Tech.) and postgraduate courses in Electrical Engineering.

The posts provide facilities for research, development and experience in industrial liaison. Successful applicants, who should possess a Degree in Electrical Engineering, can be given in-service training in teaching methods.

Salary scale : Assistant Lecturer, £800 × £25 to £1,175 per annum ; Lecturer, £1,200 × £30 to £1,350 per annum. Plus, in each case, London allowance of £36, increasing to £48 at age 37.

Particulars and forms of application from the Secretary, Northampton College of Advanced Technology, St. John Street, London, E.C.1. 2904

PHILIPS ELECTRICAL LIMITED

Electrical Appliances Division

TECHNICAL MANAGER

APPLICATIONS for this new post are invited from men of at least Graduate I.E.E. or equivalent standard, who have had experience of modern factory production methods in the small electrical appliances field.

The Technical Manager will be responsible to the Commercial Manager for liaison with technical committees of trading associations and B.S.I.; advice on the development and production of new appliances, both in this country and in Holland, and by other manufacturers; representing the Division's technical interest in industry-wide developments likely to have a bearing on the efficiency of its products.

The Technical Manager will work closely with Product Managers in the Division, the staff of technical sections in other parts of the organisation, and technical/commercial people outside the organisation.

He must, in the final analysis, be able to form his own judgment and advise the Commercial Manager accordingly.

Please write with details of age, qualifications and experience to Personnel Officer, Century House, Shaftesbury Avenue, London, W.C.2, quoting reference No. 190. 2928

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Kent Suburban District at Erith, Kent.

Applicants should have a good general education, must be neat and accurate draughtsmen, and should preferably have had experience with an electricity supply authority in one of the following : electrical plant layout; elementary building construction; mains recording.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £635 - £755 per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 8th April, 1958. Please quote ref. PER/2431/R. 2887

SALES REPRESENTATIVE

for manufacturer required for W. and N. Lancs., N. Wales, living within 20 miles Liverpool. To promote sales of "Ashley" Guaranteed Electrical Installation Accessories. Would suit hardworking enthusiast having electrical experience and connections with electrical trade, etc., in area.

Salary, commission, expenses, pension scheme. Car provided.

Full letter describing qualifications, career, age, home telephone number, confidentially to Sales Director, Ashley Accessories Ltd., Ulverston, Lancs. All acknowledged. 2833

WARWICKSHIRE EDUCATION COMMITTEE

Nuneaton Technical College and School of Art

Principal: W. H. Joint, M.A.

APPLICATIONS are invited for the post of ASSISTANT GRADE B in ELECTRICAL ENGINEERING to teach in the Electrical Installations and Radio Servicing courses for City and Guilds certificates and in the National Certificate Course in Electrical Engineering.

Industrial and teaching experience are desirable, together with appropriate qualifications.

Salary in accordance with the Burnham Further Education Report, 1956, £650 × £25 to £1,025. The starting salary may be higher than the minimum by additions for approved qualifications, training and industrial service.

Application forms and further particulars may be obtained from the Principal, Technical College and School of Art, Hinckley Road, Nuneaton, and completed forms should be returned within 14 days of the appearance of this advertisement.

N. A. Y. YORKE-LODGE,
County Education Officer.
2919

DEPUTY SUPERINTENDENT WINDING DEPARTMENT

APPLICATIONS are invited for the post of DEPUTY SUPERINTENDENT of the Winding Department, dealing with A.C. and D.C. machines.

This is a senior works appointment with promotion prospects for a man having managerial experience and knowledge of modern H.T. winding methods. Good salary, bonus and pension fund, with possible assistance in housing.

Applications, which will be treated in strict confidence, should be sent to :—

Personnel Manager
LAURENCE, SCOTT & ELECTROMOTORS LTD.
Gothic Works, Norwich

2711

ELECTRICAL ENGINEERS

BRITISH GECO ENGINEERING CO. require JUNIOR ELECTRICAL ENGINEERS for their Induction Heating Dept., situated 25 miles south of London. Applicants should be of H.N.C. standard, aged about 25, have served recognised apprenticeship and be experienced in diagrams and contract work or test and development work. Knowledge of heavy electrical engineering more important than induction heating knowledge.

These positions are permanent and progressive and qualify for entry into the company's pension scheme.

Apply giving full details of training, experience and salaries received to British Geco Engineering Co., Station Road, Edenbridge, Kent.

2770

SUPERVISING ELECTRICAL ENGINEER (OUTSIDE)

APPLICANTS should have a comprehensive knowledge of industrial electrification and installation work including motors, transformers, switchgear, etc., together with actual experience of supervision of work at site, testing and commissioning. Superannuated post.

Write stating age (not exceeding 40), with details of past experience, to—Box 2878.

TENDERING AND CONTRACT ENGINEERS

are required by the General Engineering Division of Brush Electrical Engineering Company Limited, Loughborough, one vacancy being available in each of the following sections :—

STEAM POWER STATIONS.
DIESEL POWER STATIONS.
INDUSTRIAL ELECTRICAL APPLICATIONS.

These are office appointments, which offer considerable scope for the exercise of initiative, and in which allied experience abroad would be an advantage. Applications will be welcomed from engineers who lack the necessary commercial experience but feel that given the opportunity they would enjoy this type of work. There are no age limits and a non-contributory staff pension scheme is in operation.

Applications should be addressed to the Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics. Interviews can take place in a number of large towns by arrangement. 2792

THE ELECTRICAL RESEARCH ASSOCIATION

has two vacancies for graduates on the research staff of the Rural Electrification Section :—

(a) To work on problems concerned with the applications of electricity to AGRICULTURE. Applicants should possess a good degree in electrical or mechanical engineering.

(b) To work on problems concerning the applications of electricity to HORTICULTURE. Applicants should possess a good degree in electrical engineering or physics, and some knowledge of electronics.

Previous industrial or research experience would be an advantage for either post.

Starting salary will be in the range £650-£900 per annum according to experience and qualifications. The posts are subject to superannuation under F.S.S.U.

Applications should be addressed to the Head of the Rural Electrification Section, E.R.A. Field Station, Shinfield Green, near Reading, Berkshire. 2877

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance.

SECOND ASSISTANT STATION CHEMIST, BLACKWALL POINT POWER STATION (Vacancy No. 58/209).

Candidates should have some experience of generating plant and examination of oil, fuel and water. Post offers experience in modern pulverised fuel-fired station. Salary Class F, Grade II = £725 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 7th April, 1958. 2888

JOSEPH LUCAS (ELECTRICAL) LTD.

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical equipment. Candidates should have Higher National Certificate, preferably some works training, and drawing office and design experience with small A.C. and D.C. machines. The position covers work on a wide range of machines, carries a good starting salary, and provides excellent prospects for advancement.

Five-day week. Staff pension fund.

Apply, in writing, giving details of age, qualifications and experience, to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/208.

2860

BRITISH STANDARDS INSTITUTION

PROFESSIONAL ELECTRICAL ENGINEERS are required by B.S.I. for work in an expanding section concerned with approval of electrical and other equipment. The work is of a varied and interesting nature, including the investigation of all types electrical plant, equipment and appliances. A very large part of the work is in connection with exports to Canada, and the section gives a consultative service to manufacturers in respect of Canada and some other markets. Work is also undertaken in connection with B.S.I.'s own Certification Mark Scheme.

There are vacancies as Engineers and Senior Engineers. The positions are permanent and a contributory pension scheme is in force. For Engineers the minimum requirements are an apprenticeship in electrical engineering with qualifications at least equivalent to Grad. I.E.E., salaries being in accordance with age and qualifications in a grading with a present maximum of £1,200 p.a. Salaries for Senior Engineer posts are in accordance with age and qualifications.

Apply in writing to Establishment Officer, B.S.I., 2, Park Street, London, W.1. 2926

CITY OF NOTTINGHAM EDUCATION COMMITTEE

People's College of Further Education
Principal: W. W. Dixon, M.Sc., A.R.I.C.

APPLICATIONS are invited for ASSISTANT GRADE B in Electrical Engineering to take O.N.C. and Electrical Trade classes. Applicants must have had suitable industrial experience and have H.N.C. or Final City and Guilds as minimum qualifications.

Salary in accordance with the Burnham Technical Scale with additions for training, graduate qualifications and industrial experience.

The College is developing rapidly and new buildings are now under construction. Well equipped workshops will be available in September, 1958.

Further particulars and forms of application may be obtained from the undersigned to whom completed forms should be returned by 19th April, 1958.

W. G. JACKSON,
Director of Education.

Exchange Buildings,
Nottingham. 2937

NORTH WESTERN ELECTRICITY BOARD

Demonstrator, South Lakeland District (Barrow)

APPLICANTS should be experienced in public demonstrations of electrical appliances and be competent to plan and give cookery demonstrations and lectures, and advise consumers on the utilisation of electrical appliances. They should have had a domestic science training and preferably hold the E.A.W. Electrical Housecraft Certificate.

Salary scale £500 × £20 to £600 p.a. (progress beyond £540 subject to certificate of capability. Grade 1. N.J.C. conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, by 5th April, 1958. 2890

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ASSISTANT ENGINEER is required at Hams Hall "A" Power Station, Nr. Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J12, £790 to £835 per annum, plus 10% shift allowance.

Applicants should have received a sound technical training and should preferably have had experience in the control of the works supply system. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 767MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 14th April, 1958. 2922

CLASSIFIED ADVERTISEMENTS ARE PREPAID

AIR MINISTRY

WORKS Design Branch requires in London and Provinces ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution, H.V. and M.V. Technical training to O.N.C. standard or equivalent an advantage.

Salaries in LONDON up to £1,015 per annum. Somewhat lower in PROVINCES. Starting pay dependent on age, qualifications and experience. Long-term possibilities with pensionable and promotion prospects. 5-day week, 3 weeks 3 days leave a year.

Liability for overseas service. Normally natural-born British subjects.

Write stating age, qualifications, employment details, including type of work done, to any Employment Exchange, quoting Order No. Borough 104. 257

WEST RIDING COUNTY COUNCIL

Castleford Whitwood Mining and Technical College, Engineering Department

APPLICATIONS are invited for the post of LECTURER in Electrical Engineering, to be generally responsible for the electrical course work and laboratories in the College for O.N.C. Electrical Engineering, Mining and Mining Electrical Engineering, General Mining Electrical Engineering, H.N.C. in Mining courses. There is a prospect of an H.N.C. course in Electrical Engineering in the near future.

Applicants should possess graduate qualifications and have had suitable industrial, mining and lecturing experience.

Salary in accordance with Burnham Technical Report, £1,200 × £30 to £1,350.

Application forms and further particulars obtainable from the Clerk to the Governors, 2, Wesley Street, Castleford. 2891

TECHNICIANS FOR DEVELOPMENT, TESTING AND SERVICE WORK

HILGER & WATTS Ltd., makers of a wide range of scientific instruments, seek to engage several young men with O.N.C. or G.C.E. standard in Maths. and Physics for interesting work in their laboratories and testing departments, which will include a certain amount of service and installation work away from home.

Training will be given in the specialised aspects of the work, including optics. The posts are permanent and pensionable and offer an interesting career in an expanding company.

Applications, stating age, and giving full details of education, experience and qualifications, should be addressed to the Personnel Officer, Hilger & Watts Ltd., 98, St. Pancras Way, Camden Road, London, N.W.1. Please quote Ref. B.31. 2895

ALFRED HERBERT LIMITED

Machine Tool Makers, Coventry

have a vacancy in their ELECTRICAL DEPT. for an ELECTRICAL DESIGNER/DRAUGHTSMAN. Must be an experienced and capable Designer/Draughtsman, preferably with some mechanical experience for development of electrical controls to machine tools.

Age not less than 25 years.

The position requires ability and initiative and is progressive for the right type of applicant. Five-day week and staff pension scheme.

Write stating age, full experience and technical qualifications to Employment Office, Head Works, Edgwick, Coventry. 2892

LONDON COUNTY COUNCIL

SOUTH-EAST LONDON TECHNICAL COLLEGE, Lewisham Way, London, S.E.4. Required for September, 1958, VISITING LECTURERS (day and evening) for possible vacancies in following subjects :—

Physics (Heat) up to Hons. standard.
Electronics and Control Systems, A1-A2.
Electrical Engineering and Science, S1-S3.
Radio and Television Service, Inter. and Final.

Application forms and details of payment from Secretary at College. (518) 2918

***Situations Vacant** (continued)*

SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ASSISTANT ELECTRICAL ENGINEER, Special Grade, £750-£1,030 p.a. plus £30 p.a. London allowance. Must be A.M.I.E.E. and experienced in electrical services in buildings.

Full details, present salary and 3 copy testimonials to County Architect, County Hall, Kingston, as soon as possible. 2808

A PRECISION engineering company, South Coast, Hants/Dorset, is setting up an electrical division to manufacture electro-mechanical equipment, and have a vacancy for an electrical engineer, H.N.C., capable of design and development. Apply giving fullest details of experience, age and wages required.—Box 2865.

A.M.I.E.E. or engineer with equivalent university degree required for new position involving responsibility for technical sales development of existing and new products with considerable market interest and potential. Good initial salary, superannuation scheme, etc. Apply — Sales Manager, Pyrotenax Limited, Hedgeley Road, Hebburn, Co. Durham. 2778

ASSISTANT electrical engineer required for contract work involving power cable installations and overhead line construction on sites in U.K. Excellent opportunity for young man willing to travel. Applications giving age and training to—Employment Manager, Johnson & Phillips Limited, Victoria Way, London, S.E.7. 2797

BATTERY development engineer required by Birfield Batteries Limited. Must have production knowledge of lead acid batteries and able to deal with technical applications and prepare drawings. Excellent opportunity to join a company, which is part of a large group, developing a new type light-weight battery. Apply in writing to—1325, London Road, Norbury, London, S.W.16, or telephone Pollards 5191. 2929

BATTERY sales and service engineer required by Birfield Batteries Limited. Must have full knowledge of lead acid batteries. To develop sales of a new type light-weight battery, particularly for the electric traction industry. Apply in writing to—1325, London Road, Norbury, London, S.W.16, or telephone Pollards 5191. 2930

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 273

CIVIL engineer required by the Atomic Weapons Research Establishment, Aldermaston, Berks., for planning of new works construction including radio-active and conventional laboratories and workshops with their ancillary plant and services, and the co-ordination of mechanical, electrical and civil design efforts and preparation of contractual specifications. A recognised apprenticeship or equivalent, and Corporate Membership of the Institution of Civil, Mechanical or Electrical Engineers, or exempting qualifications, required. Experience of building construction, including installation of services and plant, necessary, and knowledge of ventilation and extraction plant would be advantageous. Salary £1,300-£1,740 p.a. Contributory superannuation scheme. A house or assistance towards legal expenses on house purchase will be available for married officers living beyond daily travelling distance. Postcards for application forms to Senior Recruitment Officer at above address. Please quote Ref. 1742/48. 2864

COMPANY engaged in electrical contracting need first-class electrical engineer for service in Nigeria. Applicants must have experience of all aspects of contracting and be capable of acting for the manager in his absence. Salary and allowances in the range of £1,550-£1,750. Pension scheme. Furnished accommodation provided free. Passages paid out and home. Leave at the rate of one month in Europe for every five in Africa. Apply, please, giving brief details of career, to—Box 2910.

CONSULTING engineers require urgently junior electrical draughtsmen conversant with lighting and power designs for industrial building schemes. Good conditions, site visits, non-contributory pension scheme, bonus scheme, luncheon vouchers, etc. Write or phone—Messrs A. F. Myers & Partners, 147, Victoria Street, London, S.W.1 (Tat. 8241). 2849

DEWHURST & PARTNER Ltd., of Suffolk House, Suffolk Street, Birmingham, require the services of an area manager. Successful applicant must have a wide technical and commercial knowledge of motor control gear applications and a proven record of technical selling ability. Senior appointment. Car provided. Apply in first instance to the Regional Manager, at the above address, stating age, qualifications, selling experience and approximate salary required. 2897

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

DRAUGHTSMAN for office in Bayswater. Work mostly on electrical installations and layout for retail shops. Five-day week. Canteen. Salary according to age and experience. Apply to — Chief Engineer's Dept., United Dairies Ltd., Cumberland Avenue, Park Royal, London, N.W.10. 2896

DRAUGHTSMAN required by progressive firm for interesting work mainly in connection with electrical rotating machines and associated equipment. The position offers good prospects and a non-contributory life assurance and pension scheme is in operation. Apply giving full details of experience to — Arthur Lyon & Co. (Engineers) Ltd., Park Works, Stamford, Lincs. 2898

DRAUGHTSMAN required by telephone manufacturers in London, S.W.8. Good electro-mechanical experience essential. Please write stating age, experience and salary required.—Box 2798.

DRAUGHTSMAN required, preferably with experience of medium voltage metalclad switchgear. Bonus scheme and non-contributory superannuation scheme in operation. Housing assistance available to successful applicant. The company is in pleasant country surroundings within six miles of the South Devon coast. Write stating experience, age, etc., to—Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 2850

DRAUGHTSMEN, both senior and junior, required. Applicants should have either contract development or diagram experience on switchgear up to 11 kV, although men with good electrical or mechanical knowledge will be considered. Excellent working conditions. Good prospects. 5-day week. Superannuation fund. Interviews arranged Saturdays if desired. Apply giving full details of training and experience to — Personnel Officer, Crompton Parkinson (Chelmsford) Limited, Chelmsford, Essex. 215

EAST African installation contractors require supervising engineer, preferably experience abroad, aged 28/35, for general work.—Box 2752

ELECTRICAL engineer required by control gear manufacturers, to act as representative for Birmingham and the Midlands area working from Birmingham. Candidate should have a sound engineering training, a technical qualification and some sales experience. This is a permanent position with superannuation and excellent prospects.—Box 2899.

ELECTRICAL engineer required by electrical contracting company for service in British West Africa. Experience in preparing specifications, estimating and control and supervision of contracts essential. Remuneration £1,300 to £1,550 p.a. according to qualifications and experience. Tours 20 months followed by 4 months' leave. Free passages and furnished quarters. Pension scheme and family allowances. Please write giving age, marital status, and brief details of education and experience to—Box 2909.

ELECTRICAL engineers, junior and senior, required for consulting engineers' office in London. Salary £600-£900 depending upon age, qualifications and experience.—Box 160.

ELECTRICAL engineer required for Glasgow office of engineering division of a large organisation. Minimum technical training Higher National Certificate, and experience in preparation of schemes for power and lighting installations, costing, supervision of erection, and setting to work. Write to—Chief Engineer, The Distillers Co. Ltd., 64, Waterloo Street, Glasgow, C.2, giving full details and stating age and salary expected. 2851

ELECTRICAL test engineer to take charge of test room for transformers up to 10 kVA. H.N.C. or equivalent essential. £850 per annum, London area, five-day week. Superannuation scheme and insurance. Apply in writing giving full details of age, experience, etc., to—Box 2815.

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 275

ELECTRONIC wiring assistants. Applications are invited from men experienced in wiring electronic equipment, able to work from circuit diagrams, and preferably used to prototype work. Five-day week, canteen and superannuation scheme. Please write stating age, experience and salary required, quoting Ref. B.33, to the Personnel Officer, Hilger & Watts Ltd., 98, St. Pancras Way, Camden Rd., London, N.W.1. 2911

ENGINEER required for duties in contracts dept., engaged on the preparation of switchgear tenders and their subsequent engineering. Apply—The Power Equipment Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9. 2714

ESTIMATOR experienced in industrial electric motor control gear. Excellent permanent prospects for capable man. 5-day week. Contributory staff pension scheme.—Airedale Electrical Co. Ltd., Apperley Bridge, Bradford. 2931

HEATING and electrical engineers required by consulting engineers near Tottenham Court Road, London. Applicants must have experience in the design of services in buildings, preparation of specifications, and be capable of site supervision. Commencing salaries within the following ranges: Junior engineer, £500 to £650; Intermediate engineer, £700 to £850; Senior engineer, £900 to £1,100. Corporate membership of the appropriate institution for the senior positions is preferable but not essential.—Box 2780.

MANAGER required for Northern branch of electrical contractors. Practical engineer, experienced in estimating, supervision, administration, and ability to increase turnover. Applications stating age, experience and salary required to—Box 2781.

MANUFACTURERS of automatic electric motor control equipment require sales engineer in South Wales. A suitably trained young man with preferably a connection covering mainly industrial users could make this appointment an attractive career.—Box 2866.

MECHANIC required for West Africa. Applicant should be capable of installing and servicing general electrical equipment, including refrigerators and air conditioning units; also adaptable to servicing motor cycles and motor scooters, etc. Reply stating age, family circumstances and full details of experience.—Box 2867.

OPPORTUNITY offered to young man, under thirty, with electrical background to join the sales staff of an established firm of electric motor manufacturers in London.—Box 2817.

OVERHEAD line foreman required by Bahamas Electricity Corporation on contract for one tour of three years. Salary £1,180 a year. Gratuity £100 a year. Free passages. Liberal leave on full salary. Candidates must have experience of overhead line construction and maintenance up to 33 kV. Experience also of laying and jointing underground cables up to 11 kV an advantage. Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42381/EF. 2868

SALES engineer required by electrical distribution gear specialists for North-East Coast and Scotland. Car provided. Salary and expenses. Pension scheme. Write stating age, technical qualifications, experience and salary required.—Box 2870.

SALES engineer required by well-known company in the Yorks area for range of L.T. switch and fuse gear. The post is a very attractive one and the existing staff are all aware of the vacancy. A young man suitably trained and preferably with a connection covering industrial users, architects, large contractors and wholesalers can make this appointment an excellent career.—Box 2758.

SENIOR draughtsman required for progressive company of electrical/mechanical engineers, with experience on L.T. switchgear and fuseboards. Apply Chief Draughtsman, Peppers of Woking Ltd., Stanhope Road, Camberley, Surrey. 2774

SENIOR electrical designer required for A.C. and D.C. machines in sizes ranging from fractional to about 100 h.p. Write in confidence, giving age, experience and salary required, to—Box 2853.

SENIOR electrical draughtsman required with experience of schemes for H.V. and M.V. distribution for heavy industry, illumination and equipment for industrial building. Applicants should be qualified to H.N.C. standard. Salaries are assessed in accordance with age, qualifications and experience, and will be reviewed annually. Contributory superannuation and widow's pension funds are in operation, and there are excellent canteen, welfare and recreational facilities. Applicants should apply in writing to the Chief Engineer, Pilkington Brothers Limited, Cowley Hill Works, St. Helens, enclosing a brief history of their career and details of their education and qualifications. 2875

SENIOR engineer required by well-known London electrical contractors. Write giving full particulars.—Box 2682.

SITE supervisors, cable foremen, jointers and mates required for cable installation contracts throughout the country.—Box 2879.

SURVEYOR required for wood pole line contract in Inverness area. Good salary and subsistence to right man. Apply in writing to—B. French Limited, Pike Mills, Kidderminster. 2802

TECHNICAL assistant for sales office engaged in tendering and executing contracts for transmission line insulation. Qualifications: Higher National Certificate preferable, and previous tendering experience and ability to handle correspondence would be considered an advantage. Replies stating age, qualifications and experience should be addressed to the Personnel Officer (Staff), Pilkington Brothers Limited, St. Helens, Lancashire. 2876

TECHNICAL representative required for duties in London and the South-East. Age 25 to 30 years. Write in confidence, giving details of education, experience and salary required to — Sangamo Weston Limited, St. George's Court, 22/26, New Oxford Street, London, W.C.1. 2880

TECHNICAL sales assistant required with practical and theoretical experience of electrical engineering for sales office of manufacturer of electric arc welding equipment. Pension, canteen, welfare facilities, five-day week. Apply Murex Welding Processes Ltd., Hertford Road, Waltham Cross, Herts. 2881

TELEPHONE engineers reqd. in sales office for preparation of estimates and specifications for major contracts. Established positions for men with good practical experience of automatic exchange equipment or similar technical background. Specialised training where necessary. Acceptable personality and good education essential. H.N.C. a distinct advantage. If you can meet these requirements write to—Staff Officer, Ref. 744/6, Siemens Edison Swan Ltd., Woolwich, London, S.E.18. 2932

TESTER of automatic electric control equipment required. Interesting work with good prospects. O.N.C. standard preferred. Five-day week, pension scheme, canteen facilities. Please write giving full details of age, previous experience, qualifications, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 277

TESTER required for transformers up to 5 kVA. O.N.C. preferred. Five-day week, superannuation scheme and insurance. Salary according to age and experience. Apply in writing to—London Transformer Products Ltd., L.T.P. Works, Cobbold Estate, Cobbold Road, Willesden, London, N.W.10. 2816

WANTED, working c/h electrician. Able to set out own work. Good prospects. Write Box ER.211, c/o 191, Gresham House, London, E.C.2. 2908

YOUNG executive to handle literature in publicity dept. of large lighting mnfr. Man appointed will have ability to write and interpret tech. data for all types of lighting lit. and in conjunction with advertising agents control progress and production. Details of age, career and salary required to—Box D.14, c/o Central News Ltd., Pemberton Hse., East Harding St., London, E.C.4. 2882

YOUNG man, aged about 25, of good education, with sound electrical training, required as technical representative for the sale of resistance alloys. Excellent prospects for the right man. Apply—General Sales Director, Hall & Pickles Ltd., Manchester, 1. 2900

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

DIESEL engineer (44), wide experience marine and power station engineering, requires post as maintenance engineer anywhere in London area. — J. R. John, 28, Richmond Crescent, Haverfordwest, Pembrokeshire. 9314

ELECT. eng. desires appointment with contractors. Preparation of schemes, estimating, supervision; from tender stage to completion (London area). —Box 9306.

ELECTRICIAN (supervisor) desires o/seas contract, A.C.-D.C. generation, transmission, hospitals, factories, lifts, etc. Extensive experience, including testing.—Box 9304.

FARADAY House trained engineer, M.S.M.A. (aged 37). Background electrical contracting, marketing of sheet metal products to the electrical industry, viz., busbar systems, cable trunking, switchgear and control panels, lighting fittings. Experienced at selling at all levels, export, advertising, design, production, buying and general administration. Held present position as company manager for eight years; as company is transferring centre of operations to Midlands now seeking alternative employment in London area as sales manager or assistant.—Box 9301.

MAINTENANCE technician (electrical) desires position of service engineer requiring skill and keen assessment, experienced industrial instruments/gear. London area or Southern Counties. Age 32. Own car or works vehicle. —Box 9312.

RETIRING naval commander (42), qualified elec. and radio engineer, experience includes maintenance ship and aircraft electrical and radio equipments, management in civilian dockyards, manufacturers' liaison for development, requires progressive situation.—Box 9311.

ARTICLES FOR SALE

LARGE A.C. MOTORS

3-phase, 50 cycles

Maker.	h.p.	Volts.	r.p.m.
B.T.H.	1820	3.3 kV	368
B.T.H.	1800	400/440	368
B.T.H.	1400	6.6 kV	368
MATHER & P.	350	400/440	730
MATHER & P.	300	400/440	750
B.T.H.	275	400/440	485
B.T.H.	250	400/440	480
BRUSH	250	400/440	420
MATHER & P.	200	400/440	960
E.C.C.	175	400/440	580

Reconditioned and guaranteed.

THOS. W. WARD LTD.
Albion Works, Sheffield
Phone 26311 (ex. 347)
Grams: "Forward, Sheffield" 321

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

ELECTRIC MOTORS FOR SALE

150-h.p. Synchronous Motor by E.C.C., 400/440-3-50, 1,000 r.p.m., with control panel.

Four 90-h.p. BRUSH Slipring Motors, 400/440-3-50, 1,460 r.p.m., with o.i. starters.

45-h.p. BROOK S.C. Motor, 440-3-50, 410 r.p.m., with o.i. star delta starter.

Five 200-h.p. E.C.C. 500-volt D.C. Motors, 425 r.p.m., with BROOKHIRST panels.

120-h.p. MET-VICK. 500-volt D.C. Motor, 500/700 r.p.m., with starter.

45-h.p. MET-VICK. 500-volt D.C. Variable Speed Motor, 500/1,000 r.p.m., with starter.

REED BROTHERS (ENGINEERING) LTD.
Replant Works, Woolwich Industrial Estate
London, S.E.18
(Telephone: Woolwich 7611/6) 2913

BRAND NEW STORAGE BATTERIES

2,000 unfilled, lead acid, 2-volt cells, 570 amp. hr., ex-Admiralty. Height 15″ × 12″ × 7½″. Weight 105lbs. Bolted connections. Suitable export or might suit battery manufacturer. Extremely low price for lot. Full details from—F. G. Wilson & Sons, Hillsborough, Co. Down (Tel. 247). 9309

17-kVA ALTERNATOR

400/3/50, 4-wire, 1,500 r.p.m., belt driven, by CROMPTON PARKINSON with Isenthal A.V.R., fully equipped switchboard and slide rails. £55, loaded Surrey.

W. H. COLLINGBOURNE & CO. LTD.
1481, Stratford Road, Birmingham, 28
(Phone, Shirley 3303) 2912

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

Lane, Stanmore, Middx. (Edgware 5566/9). 91

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

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ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

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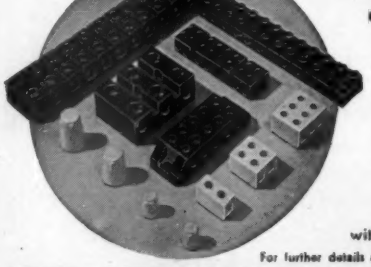

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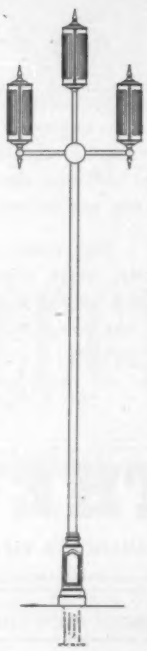

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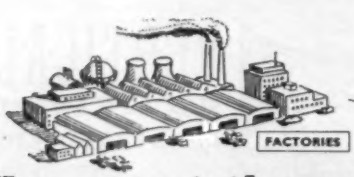
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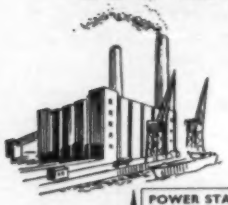
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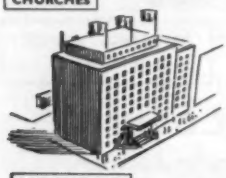
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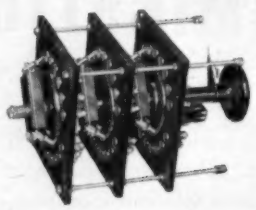

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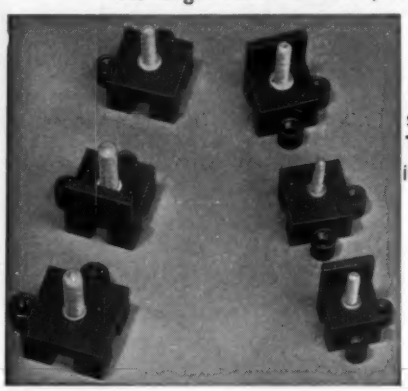

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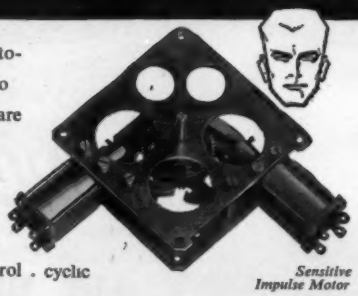

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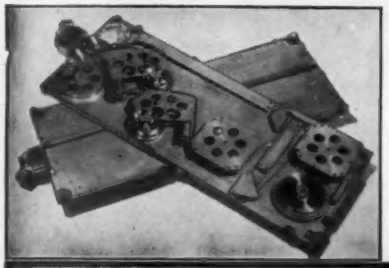

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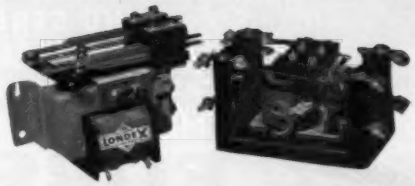

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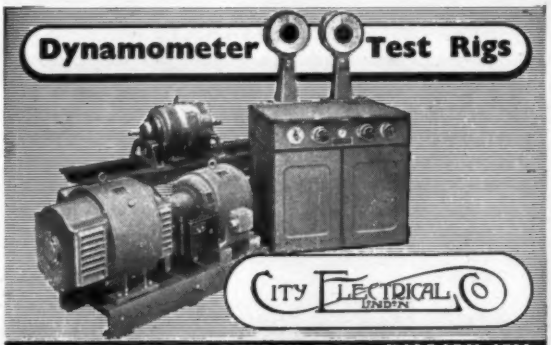

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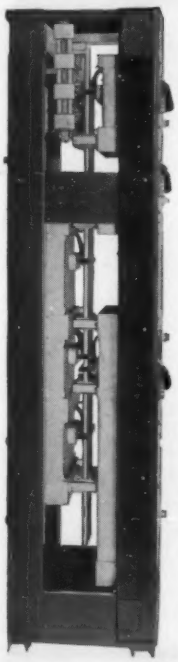

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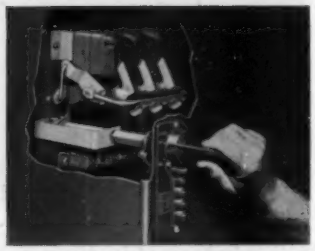

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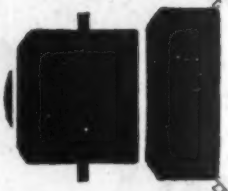

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